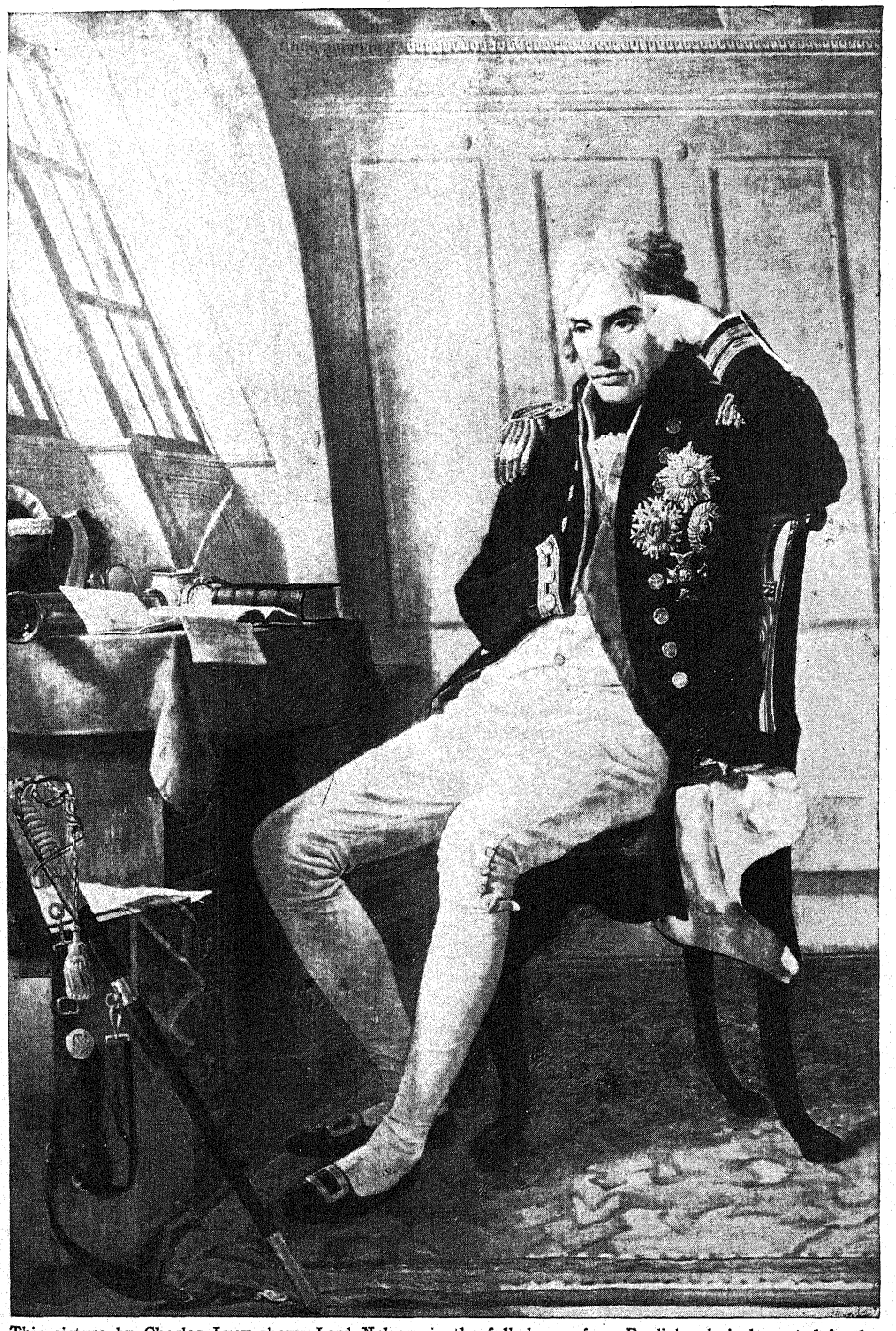
LORD NELSON IN THE CABIN OF THE VICTORY



This picture by Charles Lucy shows Lord Nelson, in the full dress of an English admiral, seated in the cabin of the Victory. Nelson was one of the greatest admirals the world has ever known. With the battle of Trafalgar ended all hope of France's resistance to England at sea, but Nelson lived just long enough to know that his great task was accomplished. He paid the price of the victory with his own life.

The Book of Knowledge

The Children's Encyclopædia

EDITORS-IN-CHIEF

ARTHUR MEE
Temple Chambers, London

HOLLAND THOMPSON, Ph.D.
The College of the City of New York

WITH AN INTRODUCTION BY

JOHN H. FINLEY, LL.D.
Late President of the College of the City of New York
Commissioner of Education of the State of New York

स्व० श्री बेनीप्रसाद टंडन
बेनीमंडी, इलाहाबाद
के संग्रहालय से
दान में प्राप्त पुस्तक

DEPARTMENTAL EDITORS

All Countries
M. Alston Buckley

Natural History
Ernest Ingersoll

Plant Life
Edward Step

Book of Wonder
Arthur Mee

Familiar Things
Harold Begbie

Men and Women
Ernest A. Bryant

Our Own Life
C. W. Saleeby, M. D.

Famous Books
J. A. Hammerton

School Lessons
A. M. Skinner, B.S.

Poetry and Rhymes
A. Von Hartmann

Dominion of Canada
W. Peterson, D. Litt., LL. D.

The United States
Holland Thompson, Ph. D.

The Earth
Ivin Sickels, M.S., M.D.

Golden Deeds
M. Perry Mills

Stories and Legends
Edward Wright

Things to Make and Do
E. R. Sayre, B.A.

VOLUMES XI AND XII

London: THE EDUCATIONAL BOOK CO.

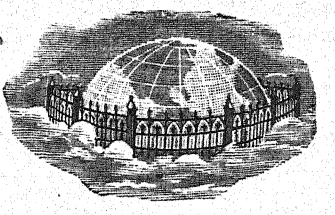
THE STANDARD LITERATURE COMPANY
CALCUTTA

Text and Illustrations in this work are protected by copyright as follows:

Copyright, 1911, 1912, 1918, 1919, by THE GROLIER SOCIETY
Copyright, 1911, 1918, by THE EDUCATIONAL BOOK CO.
Copyright, 1910, 1911, 1912, 1918, 1919, by M. PERRY MILLS
Copyright, 1908, by AMALGAMATED PRESS, LTD.
Copyright, 1868, 1870, 1872, 1874, 1875, 1876, 1878, 1881, 1883, 1884, 1886, 1887, 1888, 1889, 1890, 1891, 1902, 1906, by TICKNOR & FIELDS, JAMES R. OSGOOD & CO., and HOUGHTON, MIFFLIN & CO.
Copyright, 1874, 1880, 1892, 1894, 1895, 1896, 1904, 1908, by CHARLES SCRIBNER'S SONS
Copyright, 1908, 1909, by THE CENTURY CO.
Copyright, 1897, by HARPER & BROS.
Copyright, 1906, by THE BAKER & TAYLOR CO.
Copyright, 1901, 1902, 1906, 1907, 1909, by H. C. WHITE CO.
Copyright, 1897, 1907, by THE AMERICAN BOOK CO.
Copyright, 1890, 1899, by JAMES WHITCOMB RILEY
Copyright by PHOTOGRAPHISCHE GESELLSCHAFT
Copyright by KEYSTONE VIEW CO.
Copyright by UNDERWOOD & UNDERWOOD
Copyright by BROWN BROS.
Copyright by BROWN & DAWSON
Copyright by B. L. SINGLEY

The poems by Thomas Bailey Aldrich, Phœbe Cary, Ralph Waldo Emerson, Oliver Wendell Holmes, James Russell Lowell, John Greenleaf Whittier, Henry Wadsworth Longfellow, Edmund Clarence Stedman, Richard Watson Gilder, John Hay, Edward R. Sill, Bayard Taylor and Celia Thaxter included in this work are reprinted by permission of, and by special arrangement with, Houghton Mifflin Company, the authorized publishers of the Works of these authors. The poems by Robert Louis Stevenson, Eugene Field, Mary Mapes Dodge, Richard Henry Stoddard and Henry Van Dyke included in this work are printed by permission of Charles Scribner's Sons.

स्व० श्री बैजनाथप्रसाद टंडन
दानीमंडी, इलाहाबाद
के सग्रहालय से
दान में प्राप्त पुस्तक





CONTENTS OF THIS VOLUME

This is a short guide only to the principal contents of this volume. It is not possible to give the titles of all the Poems and Rhymes, Legends, Problems, color pages, questions in the Wonder Book, and many other things that come into the volume; but in all cases the pages where these parts of our book begin are given. The full list of these things comes into the big index to the whole work.

PAGE

THE BOOK OF THE EARTH
- The Color of the Stars . . . 2737
- The Making of Other Worlds . . 2843
- The Earth's Crumbling Crust . . 2913
- The Earth's Changing Face . . 3031
- Forests and Deserts 3125

THE BOOK OF THE UNITED STATES
- What a Great City Does for Its Children 3219

THE BOOK OF FAMILIAR THINGS
- Nothing Like Leather 2833
- The Story in a Pair of Shoes . . 3101
- Schools Founded by Famous Women . 3118
- Two Despoilers of Our Woods and Orchards 3206

THE BOOK OF WONDER
- Why Do We Dream? 2733
- What Is a Nightmare? . . . 2733
- Is Sleep-walking Dangerous? . . 2734
- Can the Flowers See? 2799
- What Is the Ether? 2800
- What Causes Tuberculosis? . . 2802
- Why Does Red Irritate a Bull? . . 2802
- What is the Difference Between Fat and Oil? 2804
- Why Is So Much of Nature Green? . 2909
- Why Do We Grow Old? . . . 2909
- Why Do I Jump When I Get a Shock? 2910
- What Is Inertia? 2911
- Can a Fish See and Hear Us? . . 2912
- Why Is It Warm in Summer? . . 3044
- Why Is It Cold in Winter? . . . 3044
- What Do We Mean by Greenwich Time? 3047
- What Is a Mirage? 3144
- How Do We Hear a Voice in the Gramophone? 3145
- Why Is Ice Slippery? 3146
- What Is a Thunderbolt? . . . 3147
- Why Does It Rain So Much in Scotland? 3148
- What Makes the Sound in the Organ? 3150
- Can a Sound be Felt? 3225
- Why Does a Diamond Cut Glass? . 3230
- Why Does Yeast Make Bread Rise? . 3233
- Why Have Factories Tall Chimneys? 3234

PAGE

THE BOOK OF NATURE
- The Bees and Wasps 2849
- The Life of the Ant World . . 2965
- Butterflies and Moths 3011
- Splendor in the Grass 3055
- Some Insect Foes of Man . . . 3195

THE BOOK OF CANADA
- The Indians of Canada . . . 2781
- Wild Flowers of Canada . . 2877, 3063
- Common Land Birds of Canada . . 3151

THE BOOK OF MEN AND WOMEN
- American Inventors 2711
- The Builders of Florence . . . 2787
- Slaves Who Became Famous . . 2937
- Naval Heroes of Young America . 3003
- Some Founders of Religions . . 3023
- American Songs and Song Writers . 3049
- Famous Women of the United States . 3119
- Kings and Queens of Scotland . . 3133

THE BOOK OF OUR OWN LIFE
- Food and its Uses 2727
- Nature's Wonderful Food . . . 2827
- The Bread by Which We Live . . 2947
- How and When to Eat . . . 3097
- The Real Value of Foods . . . 3179

THE BOOK OF GOLDEN DEEDS
- A Girl's Desperate Ride . . . 2813
- An Apronful of Gunpowder . . 2814
- In Lake Michigan at Midnight . . 2815
- A Brave Woman 2815
- The Brave Constable of France . . 2816
- A Race for the Life Boat . . . 2999
- The Brave Maid of the Mill . . 3000
- The Bold Hero of the Mountains . 3001
- The Friend of the Slaves . . . 3069
- The Apprentice Boy and His Master's Children 3070
- The Lawyer Who Lost His Fee . . 3071
- The Friends Who Were Not Divided . 3071
- Some Modern Heroes of Science . 3235

THE STORY OF FAMOUS BOOKS

THE STORIES OF CHARLES DICKENS
- The Old Curiosity Shop . . . 2773
- Barnaby Rudge 2777

PAGE

David Copperfield 2861
Charles O'Malley 2975

THE BOOK OF STORIES

Beauty and the Beast 2749
The Riddle of the Sphinx . . . 2752
Noureddin and the Wonderful Persian 2753
The Luck of Simple Jack . . . 2754
The Treasure of the Poor . . . 2756
Legends of Places and Things . . 2758
How a Sultan Found an Honest Man 2759
The Knight and the Wonderful Stone 2759
The King Who Came to Cashmere . 2759

THE STORY OF PETER PAN

How Peter Found His Shadow . . 2887
The Lost Boys in Never-Never-Land 2888
How the Children Went Home Again 2892

The Old Couple at the Mill . . 2943
The Princess Who Became a Goose Girl 2944
The Cat and the Parrot . . . 2946

ALICE'S ADVENTURES IN WONDERLAND

Alice in Wonderland 2953
The Mad Tea-Party 3089
Alice and the Queen of Hearts . . 3157
Aesop's Fables . 2893, 2963, 3096, 3166
Jack and the Beanstalk . . . 3207
Little Stories About Flowers . . 3210

THE BOOK OF POETRY

Ho! For a Frolic 2742
The Ballad of Agincourt . . . 2743
To a Nightingale 2744
True Greatness 2745
Dobbin's Friend 2745
Things that Never Die . . . 2745
Only a Baby Small 2745
What the Stars Have Seen . . 2746
The Discontented Apples . . . 2746
Willie's Lodger 2746
What Might Have Been . . . 2746
The Norman Baron 2817
The Song of the Shirt . . . 2818
The Angel's Whisper 2818
The Lay of the Last Minstrel . . 2819
To a Waterfowl 2820
A Ternarie of Littles 2820
Babyland 2820
The River 2820
The Bells 2821
Say Not the Struggle Naught Availeth 2822
The Industry of Animals . . . 2822
Auld Lang Syne 2822
Little White Lily 2822
Songs from Shakespeare . . . 2929
The Fall of Cardinal Wolsey . . 2930
The Great Speech of Mark Antony . 2931
The Shepherd's Happy Life . . 2932
A Great Day for England . . . 2933
The Noblest Roman 2933
The Lesson of the Honey Bees . . 2933
In Praise of England 2933
A Father's Advice to His Son . . 2934
Man's Greatest Treasure . . . 2934
The Wayward Daughter's Fate . . 2934
A Man's Good Name 2934
The Quality of Mercy . . . 2934
Friends and Flatterers . . . 2934
The Light of Our Virtues . . . 2934
The Seven Ages of Man . . . 2935

PAGE

Wise Sayings from Shakespeare . 2935
The Curfew Bell 3037
Oh, Look at the Moon! 3038
Mine Host of the "Golden Apple" . 3038
Rock of Ages 3038
A Prayer 3038
Welcome to Spring 3038
German Folk-songs in English . 3039
The Prisoner of Chillon . . . 3175
The Old Clock on the Stairs . . 3176
The Spring Walk 3176
The Faithful Bird 3177
The Council of Horses 3177
The Wind and the Moon . . . 3178
The Best School of All . . . 3178
Little Verses (with music) 2747, 2823, 3040

THE BOOK OF ALL COUNTRIES

Germany As It Is To-day . . . 2761
Austria-Hungary, a Dual Monarchy . 2895
Switzerland of the Snows . . . 2981
Italy, the Land of Romance . . 3073
The Balkan Peninsula . . . 3185

THINGS TO MAKE AND TO DO

Photography Without a Camera . . 2719
Box Furniture 2721
A Use for Walnut Shells . . . 2725
Having Fun in the Water . . . 2726
How to Dance the Morris Dances . 2805
The Robbers and the Soldiers . . 2806
The Puzzle of the Secret Lock . . 2806
How to Make a Magic Lantern . . 2807
The Game of "What-Is-Its-Name?" 2812
A Violin from a Cigar-box . . 2869
A Bead Belt that Any Girl Can Make 2870
The Pillars of Solomon . . . 2872
Staining and Polishing Wood . . 2873
A Portable Stool 2875
A Windmill from a Square of Paper 2875
How to Study the Weather . . . 2993
A Clever and Amusing Word Game . 2994
A Little Vegetable Garden (March) . 2995
A Good Game to Play on a Train . 2995
Hare and Hounds on Horseback . . 2996
The Way to Use a Microscope . . 2998
What to Do in Case of Fire . . 3113
The Wizard's Wand and Magic Purse . 3114
How to Make a Wheelbarrow . . 3115
Things to Make from an Elder Branch 3116
Our Toy Zoo 3117
A Game with Music 3117
Golf for Boys and Girls . . . 3211
A Novel Napkin-ring 3214
Making a Garden Seat . . . 3215
The Self-suspending Wand . . 3216
A Little Vegetable Garden (April) . 3217
What Is Wrong in This Room? . . 3218

THE BOOK OF SCHOOL LESSONS

READING

Words Used in Place of Nouns . . 2921
The Different Kinds of Pronouns . 3167

WRITING

Capital I, J, C, E, and G . . . 2922
Capital M, N, S, L, and D . . . 3168

ARITHMETIC

The Way to Multiply Big Numbers . 2923
Multiplying Big Numbers . . . 3169

PAGE

MUSIC

The Maps Which the Fairies Made . 2924
The Beautiful Land of Sound . . 3171

DRAWING

Drawing and Painting a Daisy . . 2926
Measuring Things from a Distance . 3172

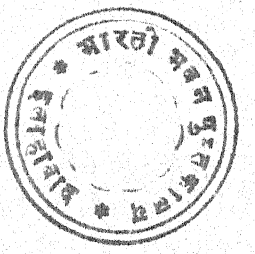
FRENCH

Little Picture Stories . . . 2928, 3174

PAGE

COLORED PLATES

Lord Nelson in the Cabin of the Victory . . . . . *Frontispiece*
The Light that Explains the Stars to Us 2736
How the Starlight Tells Us What the Stars Are Made Of . . . 2740
Some Well-known Butterflies and Moths 3010
The Old Woman Tossed in a Basket . 3042
Crimson-topped Woodpeckers and Others 3150
Some Insects in Their Natural Colors 3194



D30/130

WHAT THIS STORY TELLS US

IT is said that the people of the United States take out more patents than those of any other country. In no other country is so much machinery of so many kinds used, and nowhere else are so many things which save labor used in the house or in the office. There are several reasons for this. The people of the United States have always been ready to try new things. They have not thought that they must do a thing simply because their grandparents did. Another reason for the use of so much machinery is the high wages paid in this country. When labor costs a great deal employers will be glad to get machines to do the work of muscles, whenever possible. A third reason is the fact that the people of the United States are better able to buy new inventions than those of any other large nation.

AMERICAN INVENTORS AND INVENTIONS

CONTINUED FROM 2627



WAGES are higher in the United States than anywhere else in the world. This has been true from very early times, and the fact has had great influence upon the growth of the country. The reasons for the high wages we cannot stop to discuss here, but they have brought many immigrants to the United States.

WHAT MUST ALWAYS FOLLOW HIGH WAGES

Where wages are high, employers will try to get their work done with as few workmen as they can, and this is one of the reasons why the United States is ahead of the world in labor-saving machinery. Though the machines may cost a large amount of money, they often pay for themselves in a few years, long before they are worn out. In fact manufacturers often throw away a good machine when a better is invented.

In Europe wages are lower than they are in the United States, and therefore we find many things done by hand in all the countries of Europe which here are done by machines. In India wages are still lower and there we find very little machinery. You can see why this is true. An employer who can use much hand labor does not need to put much money into expensive machinery, and does not need to construct buildings at high cost.

Americans began to invent very early, though as there was no Patent Office in this country then, we do not know exactly what was done. Because of the rough roads, the British wagon which the colonists had brought with them was changed in several ways. Thomas Jefferson improved the plough then in use. The axe is another tool which was somewhat changed in shape by the colonists.

One of the first of our inventors was Benjamin Franklin, about whom you can read in another place. Born a poor boy in Boston in 1706, he became the companion of princes and the friend of the greatest men of his time. When still a young man he improved the printing press, and though these Franklin presses would now be considered so slow that no one would think of using them, they were better than anything before them.

Of his discoveries in electricity you are told on page 2164. The lightning rods you now see on barns or houses in the country are his invention, made in 1752. Another was a stove in 1742, intended to save a part of the heat, which went up the chimney from the open fireplaces. Many thousands of them are still in use.

THE COTTON GIN AND THE SUCCESSFUL STEAMBOAT

You have also been told of the invention of the cotton gin by Eli Whitney in 1793. This machine is one of

Copyright, 1911, 1918, by M. Perry Mills.

the most important inventions ever made, and is one of the few machines which have been very little improved since first shown to the public. It made cotton growing profitable, and slavery, which seemed to be dying out, became so firmly fixed in the cotton-growing states that only a great war and the sacrifice of hundreds of thousands of lives could drive it out.

In another place you have been told of Robert Fulton and his steamboat, the Clermont. Fulton was not the first person to build a steamboat, as you know, but he was the first person to run one successfully, and the trip from New York to Albany, in 1807, marked the beginning of the steamships of the present day. You can see that a sailing ship could not always be used on a river if the wind blew the wrong way. A steamship can be used at all times.

INVENTIONS SELDOM THE WORK OF ONE MAN

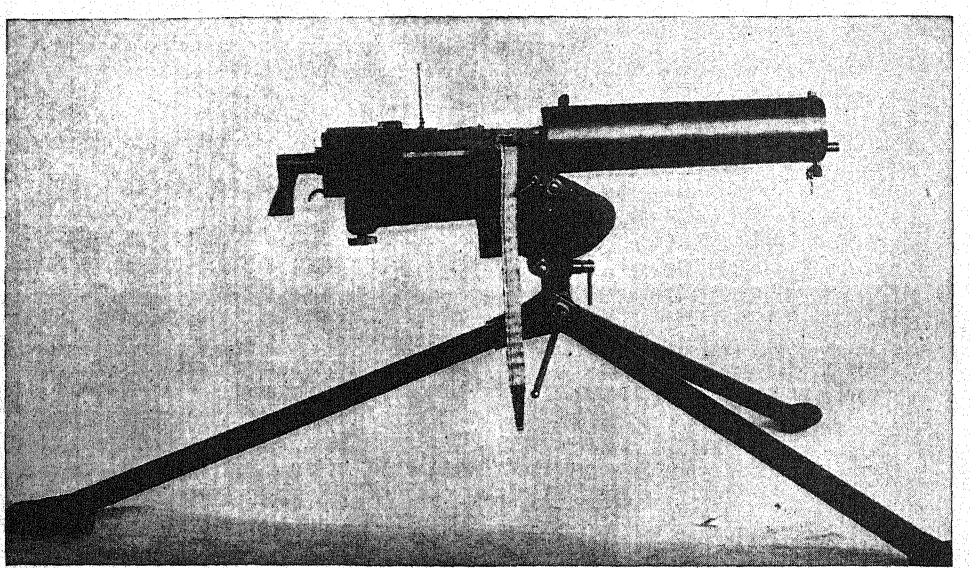
It seldom happens that an invention is the work of one man. The first man gets an idea but he cannot quite make it work. Another makes an improvement, and then another, and finally some man, using the work of those who have gone before, reaches success.

Inventors do not always get the benefit of their inventions. They are seldom good business men, and are often very poor, sometimes because they are so much interested in their ideas, that they will not work at their trades. It often happens, therefore, that they sell their inventions for a small part of their value. Some men have died in poverty, while others have made great fortunes from their ideas. We shall speak of some of these as we go along.

IMPROVEMENTS IN FIREARMS AND OTHER WEAPONS

Now American rifles, shot-guns and revolvers are among the best in the world, but no one man is responsible. As early as 1811, a man named G. H. Hall made a gun which could be loaded at the breech, as the end of the barrel next to the wood is called. Some of them were made for the United States army in 1818. Many men had tried to do something like this before but had not been successful. Now soldiers are armed with breech-loading guns, which often carry several extra cartridges also.

In 1830, Samuel Colt invented a new form of pistol which could be fired several times. In 1835 he improved this by making the part containing the cartridges revolve, and so the weapon was called a revolver. This pistol could be fired many times while the old-fashioned pistol was being loaded once. Mr. Colt began to



Copyright, Committee on Public Information, from Underwood & Underwood.

In a test this heavy Browning Machine Gun, weighing only 34 pounds, fired 39,000 shots without stopping. The end of the barrel shows at the right, and the cylinder around it is filled with water to prevent the barrel from becoming red hot. The cartridges are in belts of 250, and one belt can be fastened to another.

स्व० श्री बेनीप्रसाद टंडन

manufacture them at Hartford, Connecticut, and his factory grew to be one of the largest of its kind in the world. In this case a large fortune was gained by the inventor himself.

We hear much of machine guns these days. They are guns which can be fired two or three hundred times a minute. Many men had worked on the idea, but Dr. Richard Gatling was the first person to succeed. He completed his gun in 1861, and some of them were used during the Civil War. This gun had ten barrels. Many improvements have been made since, and now some machine guns are not much heavier than rifles.

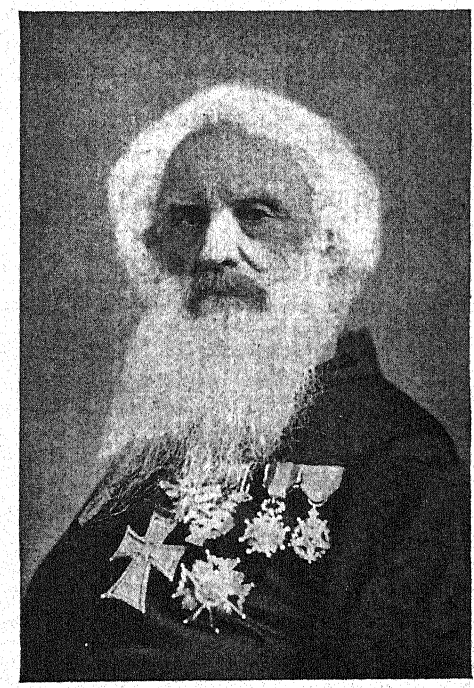
The gun now used in the United States army is the Browning, named for its inventor, John M. Browning. The army officers declare that it is the best in the world. The barrel of the heavy gun, a picture of which is shown, is surrounded by a water jacket to prevent it from getting red hot. The cartridges are placed in belts, each containing two hundred and fifty, and one belt can be fastened to another. In a test 39,000 shots were fired without stopping. There is a lighter Browning gun which can be carried by one man. The latter is really a kind of repeating rifle.

THE PROFESSOR WHO INVENTED THE TELEGRAPH

You have been told something of the invention of the telegraph by Professor S. F. B. Morse. He was born in Charlestown, Massachusetts, in 1791. His father, Reverend Jedediah Morse, was one of the first American authors of textbooks, and sent his son to Yale, where he had himself graduated. After young Morse graduated he went to Europe to study art and remained several years. He came to New York in 1815, and was successful as a painter. After another stay in Europe he became professor in the University of the City of New York. One of the other professors was lecturing on electricity, then not very well understood, and in 1832 Professor Morse got the idea of the telegraph, and in 1835 succeeded in his experiment in one of the buildings of the University.

Some improvements were made and in 1838 he asked the United States Congress to build a line from Washington to Baltimore to see how it would work over long distances. Most people laughed at the idea and Congress did not vote the money. He then went to Europe to try to get some foreign government to give him the money, but was unsuccessful there also. He continued working on his invention and trying to get money to build a line, but without success. Finally, when he was just about to give up, Congress, on the last day of the session, March 3, 1843, voted $30,000. With this the line was built, and on May 24, 1844, the message, "What hath God wrought!" was sent from the Capitol at Washington to Baltimore.

Though his claim to the invention was



Samuel Finley Breese Morse.

disputed, Professor Morse was successful in defending his rights. He received much money from the invention and many honors were awarded him by European governments. Our own government, as you know, does not reward inventors in this way.

HOW GRAIN WAS CUT IN THE EARLY PART OF THE CENTURY

In the early days of our country grain was cut with a sickle, a picture of which you may have seen. It was in shape much like the "question mark," which is put at the end of some sentences. A man seized a handful of the grain in one hand and cut it off with the sickle. Next

a "cradle" was used. This was a long curved knife at the end of a handle, with wooden fingers which kept the grain from falling. Some of them are still used on small farms or upon rough ground.

Obed Hussey and Cyrus Hall McCormick were working on a new machine to cut grain at the same time, and both received patents: one in 1833, and the other in 1834. The more successful was the McCormick machine. This machine, which was drawn by horses, cut more than many men could do by hand. At once others began to try to improve this machine, and just before the Civil War, John E. Heath invented a machine which not only cut the grain but tied it into bundles, thus saving much more labor. Now to some of these machines a threshing machine is added, which separates the grain from the chaff, as it is drawn along. We show a picture of one of these machines on page 1130.

Other Improvements in Farming Machinery

There have been many other improvements in agricultural machinery. You remember the picture of the plough used in the Philippines, which is hardly more than a crooked stick. Only a little more than a hundred years ago, such ploughs were common in this country, though the point was covered with iron. Thomas Jefferson invented an improved form of plough. In 1797, Charles Newbold, of New Jersey, invented an iron plough, but the farmers would not use it as they feared that the iron would poison the soil. Besides it was very heavy and expensive.

Jethro Wood, in 1819, invented an iron plough made in several parts so that if one broke it could be replaced without trouble, and this came into common use. Then the plough was put on wheels, and instead of holding the handles, the farmer has a comfortable seat and drives the horses. On the great farms in the West, many ploughs are pulled along at the same time by one engine called a tractor.

These tractors are used for many purposes. They draw agricultural machinery; they pull heavy wagons along the roads and through the fields; they pull up stumps. They also furnish power to run threshing machines, corn shellers and the like, and to do many other kinds of work around the farms.

Only a few years ago all hay was raked by hand. Now a horse-rake does as much as twenty or thirty persons could do, and when the hay is partly dry, a tedder scatters it, so that the sun can reach every blade. We have also machines which sow the seed and then cover it up. There are machines to gather corn, to husk it, and separate it from the cob. If corn had to be separated from the cob by hand, it is said that it would take all the people in the United States one hundred days a year to do this work.

Some Interesting Figures about Farming

Some one has calculated that now it takes on the average only ten minutes of labor to grow a bushel of wheat, while seventy-five years ago it took three hours. It takes forty-one minutes of labor to grow a bushel of corn while then it took four and a half hours. A hundred years ago about three-fourths of the people lived on farms. Now something less than one-third are able to raise food enough for the whole population and have some to spare for other nations. The chief cause of this is the invention of farm machinery.

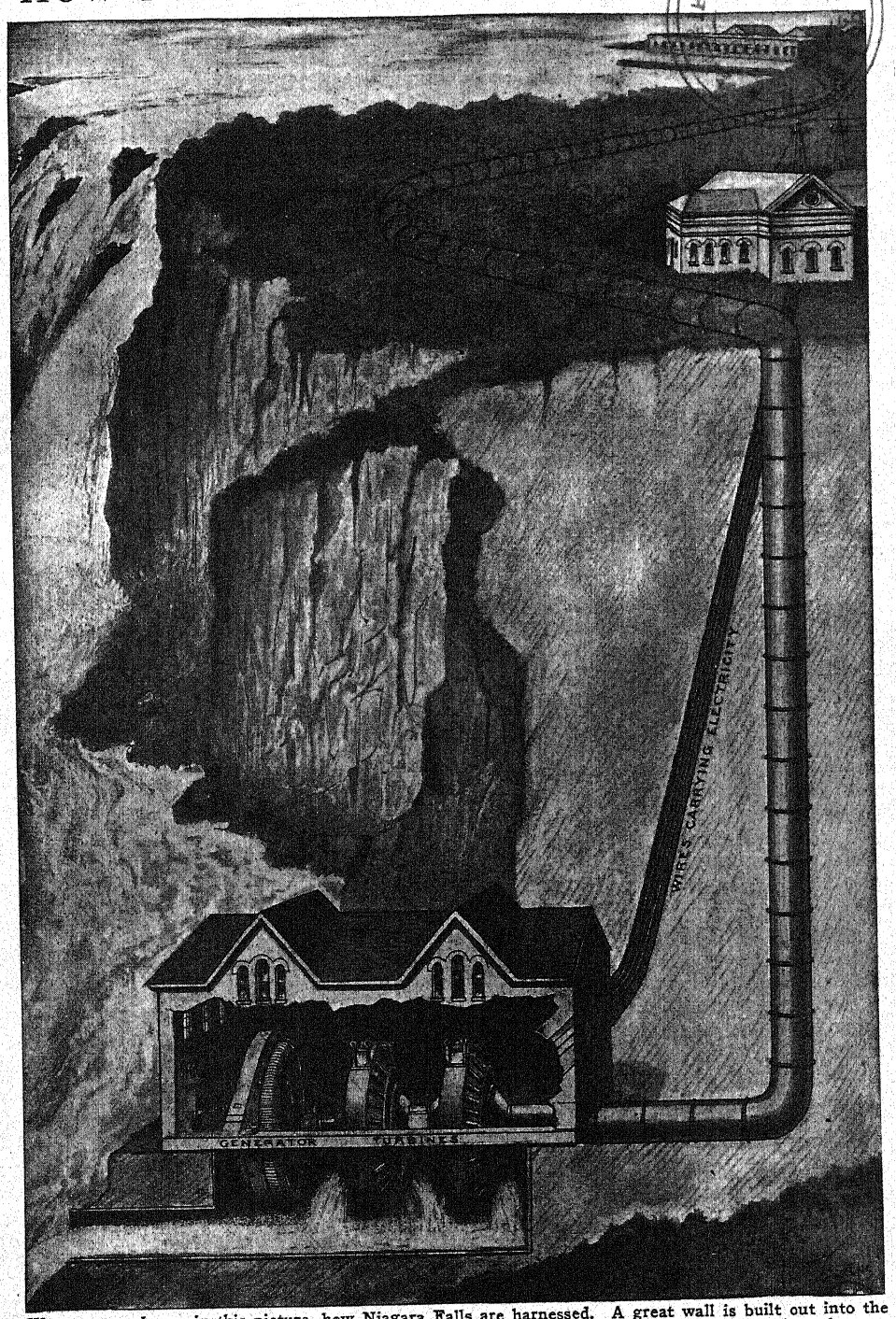
Land can be ploughed in less time; seed is sown by a drill instead of by hand; there is less hand work in cultivation, and reaping takes less time also. Then wheat is threshed by machinery instead of being beaten out by flails. Fewer people raise more grain than seventy-five years ago.

The Man who Found Out about Rubber

Another important invention was that which made possible the use of rubber. Rubber, which is the sap of a tree, was known to the natives of South America before the discovery of America, but was unknown in this country until 1800, when some was brought by a sea captain. The natives of South America made clumsy shoes of it, and some were sold in the United States. After about 1823, many men tried to make rubber cloth, but did not succeed, as it melted and stuck in summer, and cracked in winter.

Charles Goodyear, who was born in New Haven, Connecticut, in 1800, was a hardware merchant, but was not successful. He became interested in rubber and tried many experiments. It is said that in 1838 or 1839, he accidentally dropped some rubber and sulphur on his kitchen stove and found that he had by chance succeeded in doing what he had failed to

HOW NIAGARA SENDS POWER 300 MILES



We see at a glance, in this picture, how Niagara Falls are harnessed. A great wall is built out into the river to divert part of the water to what is called the forebay. From here the water passes into the penstock, the huge pipe through which it falls 180 feet with terrific force, turning the turbines at the bottom. The turbines, in their turn, drive the generator, which generates the electricity. The current is carried by wires to the distributing station above, and is then sent all over the surrounding country.

do by experiment. This process is called vulcanization, and was the beginning of the rubber business.

We use rubber so much now that it is hard to understand how people ever got along without it. Millions of pairs of boots and shoes are made every year. Rubber blankets and rubber coats are much used; belts are made of rubber, and hose for fire companies and for the garden requires a great deal; hot water bags and cushions take thousands of pounds, and much is used to make rings to seal jars and bottles. Pencil erasers, tennis balls, and rubber stamps also require large quantities.

During the past twenty years, millions of pounds have been used for tires for motor cars and other vehicles. One can hardly think of the motor car with iron tires, and every year more carriages are fitted with rubber tires, to say nothing of bicycles. These are only a few uses of rubber. You can name dozens of others yourself.

Mr. Goodyear and his brother, who was also interested, next began to try to make rubber hard. They were successful in 1851 and now combs, buttons, bottles, inkwells, penholders, fountain-pen barrels and many other things are made of hard rubber. The chief difference in making hard and elastic rubber is the amount of sulphur and the degree of heat used. Mr. Goodyear seems to have been a poor business man, and though he took out sixty patents on his inventions, he did not gain much money and died a poor man.

SLEEPING CARS WHICH MAKE LONG JOURNEYS POSSIBLE

In this country distances are so great that it is often necessary to spend one or more nights on the train. Once people had to sit up in the uncomfortable seats and try to sleep in any way they could. Now one can have a good bed, and many persons sleep as well on the train as they do in their own homes. The first car arranged for sleeping was planned by a man named Woodruff in 1856, but it was not very comfortable. In 1863, George M. Pullman, a carpenter and builder, of Chicago, built a car on a new plan which could be used as an ordinary car during the day, and arranged for sleeping at night. It was much superior to anything ever known before, and now Pullman cars are used on every railroad in the country, and one can go quite comfortably from Boston to San Francisco. The company which he founded not only builds these cars, but also parlor cars, and dining cars, and furnishes attendants to go with them. The conductors and the porters are paid by the Pullman Company and not by the railroads. Mr. Pullman also invented the method of enclosing car platforms so that one can pass easily from one car to another without danger of being thrown off.

WHAT MAKES HIGH BUILDINGS IN THE CITIES POSSIBLE

On other pages you see some of the high buildings in New York, and other cities. Without elevators such buildings would be impossible, as no one would care to climb ten, twenty or thirty flights of stairs several times a day. There are more high buildings in America than anywhere else and so it is natural that the elevators should be better.

The first passenger elevator in the United States was invented by Elisha G. Otis in 1853, but has been much improved since. At first elevators were very slow and not very safe, but now they move very rapidly and accidents are not common. Nowadays most elevators are run by electric power, though there are many which are raised or lowered by water pressure. We call these hydraulic elevators.

SOME IMPROVEMENTS IN STOPPING RAILWAY TRAINS

When railways first began to run trains were short, the cars were light, and speeds were not great. Hand brakes worked by a wheel and a chain were able to stop the cars, though accidents sometimes occurred. As speeds grew greater accidents grew more frequent, for the brakemen could not always stop the trains in time. As you know, the swifter the speed and the heavier the object, the more difficult it is to stop quickly.

The man who made it possible to run the heavy trains of to-day at high speed was George Westinghouse, who was born in Central Bridge, New York, in 1846. While still a boy he served in the Civil War, and then went to college. It is said that one day his train was delayed because of a collision which had occurred because the engineers could not stop their trains, and that he began to plan some way of stopping trains more quickly. In 1868 he invented an air brake, which was carried on the engine. Air was com-

pressed, and when released ran through pipes under the cars and pushed the brakes against the wheels. The invention worked, but has been much improved since. The chugging you hear on an engine standing at the station is the air brake, which stops the train or prevents it from running away when going down grade. Mr. Westinghouse also made other inventions, and built great works to manufacture electrical machinery.

THE SEWING MACHINE, WHICH HELPED THE WOMEN

No one man invented the sewing machine, which has been of so much benefit to the world. In the days when all seams were sewed by hand people generally could have few clothes for there was not time to make them. Now many garments can be made in a very short time, and can be sold at a much lower price than was possible before the invention of the sewing machine.

An Englishman made a sort of sewing machine as early as 1790, and a Frenchman followed in 1830, but neither came into common use. Two other Englishmen patented a machine in 1841, but the first really successful machine was the invention of an American, Elias Howe, which he patented in 1846. At first he could get no one to furnish the money to manufacture machines and sold the English rights for $1,200. For years he was wretchedly poor. Finally he was able to interest some men with money and became wealthy.

Other men have also done work on the sewing machine. The improvements of A. B. Wilson and Isaac M. Singer were important. The latter introduced the treadle, so that the machine could be worked by the feet, instead of by hand as before. Other machines, for sewing leather, and similar thick substances, were invented later, and now there are dozens of different types, all good, and American machines are sold all over the world. In the great factories the machines are often run by electric power.

There are many inventions of which one never hears, that have added very much to our convenience and comfort. Once shoes were divided into two classes, those in which the sole was sewed on by hand, and those in which it was fastened on by wooden pegs or iron nails. The first kind was very expensive and the second kind was stiff and uncomfortable. In 1871 a man named Goodyear, who was related to the rubber man, invented a way by which the soles could be sewed by a machine. The shoes made in this way were not so good as those made entirely by hand, but they were much better than those which had the soles nailed on.

This was only the beginning of inventions used in making shoes. Dozens have been made since, nearly all of them by Americans, and now the American shoe factories are one of the wonders of the world. Some of the machines are shown you in another place, where we tell you how shoes are made.

VARIOUS INVENTIONS WHICH MAKE LIFE EASIER

You were shown, in the story of Bread and Butter on page 1137, the old-fashioned mills where wheat was ground between two stones. In 1875 F. Wegmann, an American of German blood, invented a way of crushing the wheat between smooth steel or porcelain rollers. In this way a larger quantity of flour was gotten from a bushel of wheat, and the flour was whiter.

It is not certain that the invention of the roller-mill, as it is called, has been altogether a good thing. The flour that was ground between stones in the old-fashioned mill was not so white, but it did have all the life-sustaining properties of the wheat. In the attempt to make flour as white as possible, some of these are often left out, and go with the waste. Animals then get what we need. Man has seen the harm of this and now much flour from roller mills contains these valuable food materials.

We use the telephone so much that it is hard to think of a time when we did not have this easy way of talking with our friends or with the grocer or the butcher. You have been told how an American, though he was born in England, invented this instrument. Nearly all the improvements on it have been made by Americans, and now an American, Professor M. I. Pupin, has discovered a method by which he thinks we shall some day be able to telephone across the ocean with no more difficulty than we now talk to a neighbor.

ONE MAN WHO HAS HUNDREDS OF PATENTS

One man has invented so many things that a list of them would fill several pages of our book. This is Thomas A. Edison,

2717
दान में प्राप्त पुस्तक

and we give a special article to him and his inventions.

We must mention the type-setting or type-casting machine, which is described under The Wonder of a Book, on page 947. This was invented by Ottmar Mergenthaler, and this machine, with some improvements, is used in the office of every large newspaper to-day.

As we have said many times, no one man ever makes a perfect machine. The idea of the automobile is old, for every locomotive is an automobile, but not until the gasoline engine was invented could a motor car which was both light and strong be made. The first gasoline engines were not very reliable, and the first motor cars often had engine trouble. The same is true of motor boats. Many men both in Europe and America have helped to make these engines successful, and it is very difficult to mention one without mentioning a dozen others.

How the Convenient Typewriter Was Invented

The business man of to-day would not know how to get along without the typewriter. On it letters are written quickly and legibly, and copies can be kept, so that much trouble may be avoided. Yet the typewriter is a modern invention, and men of fifty years ago knew nothing of it.

Christopher L. Sholes, an editor of Milwaukee, felt the need of a machine to number tickets, coupons and blank books, and set to work to invent one. He succeeded, and then decided to make a writing machine. Several men had already tried, but their machines were clumsy and got out of order easily. With two friends, Mr. Sholes secured a patent in 1868. The machine was heavy and clumsy, and corrections could not be made, but the right idea was there. One of the letters written on this machine fell into the hands of James Densmore, and he bought a share in the patent. Model after model was built, each a little better than the one before, and, in 1873, the invention was bought by Remington and Sons, who owned a fine machine shop, and gave the new machine their own name. Sholes sold his share for $12,000, but Densmore preferred to receive a small sum on every machine made, and is said to have received a million and a half dollars before the patent expired. Many changes and improvements have been made in the Remington machine, and in many others which have been patented, but to Mr. Sholes is due the credit of the first practical typewriter.

An inventor who turned his mind to many things was Thomas Blanchard, who invented a machine to pare apples while only a boy. Next was a machine to count tacks, then made by hand. Soon he invented a machine to make the tacks, which is still in use, though somewhat improved. His most important invention was the copying lathe, which copies exactly the model placed in the machine. This was first used to make gunstocks, and lasts for shoes, then used so much. For many years Mr. Blanchard was employed in the United States Arsenal at Springfield, Massachusetts, and there the original lathe may be seen to-day. Another machine, for bending wood for shipbuilding, or for making curved handles for ploughs and other tools, and making wooden wheels, brought him in more money than his more important inventions.

America's Share in Conquering the Air

Very great difficulty is found in giving credit to any one man for the invention of flying-machines, except that we can say that there is no doubt that the share of the United States has been the largest. The most credit belongs to Professor S. P. Langley, of the Smithsonian Institution in Washington, though his machine never really flew. But his experiments showed the way, and the Wright brothers, Orville and Wilbur, in a small Ohio city, were the first to make machines which would really work. The Wrights have made improvements themselves, and in Europe many machines a little different have been made, but our share in the glory of conquering the air is the largest.

There are hundreds of other inventions of which we might speak. The bicycle as we have it to-day is almost entirely American, and the convenient hand camera is also. In our story about moving pictures we tell you something about the cameras which have been made. Electric locomotives to pull heavy trains are American, as also is the greatest improvement in weaving machinery. Then too there are thousands of little things which we cannot mention, but enough has been said to show you that American skill and genius have done much.

THE NEXT STORY OF MEN AND WOMEN IS ON PAGE 2787.

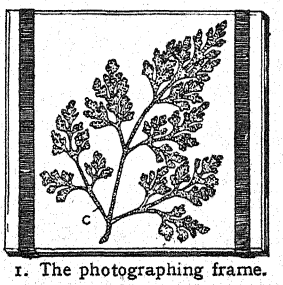


PHOTOGRAPHY WITHOUT A CAMERA

CONTINUED FROM 2591

MOST people think that nobody can take a proper photograph without a real photographic camera, but this idea is quite wrong. We shall see how any boy or girl can take a photograph without a camera.

In picture 2 there is a photograph of a lake scene, and on the next page is shown a picture of a little girl and a photograph of some leaves. Well, these photographs were taken without a camera of any sort. It took about half an hour to do them, and each one cost only a cent or two.



1. The photographing frame.

If we would like to do some like them, we must first go to a shop where they sell things for photographers and ask for a packet of "self-toning" paper. All photographic shops keep it, and it is not at all expensive. One packet will last a long time, and we can take twelve big photographs, or forty-eight little ones, about the size of the one on this page, with it.

Then we must ask for one pound of "hypo." This is also very cheap. That is all we need to take our photographs: just one packet of self-toning paper and one pound of hypo.



2. Photograph of picture taken without a camera.

We open the packet of paper, and find that it is shiny on one side. Now, if we cut a little piece off one sheet, and take it out of doors into the light, we shall find that in a few minutes the shiny side begins to turn dark. We can watch it getting darker and darker until it is quite black. If we hold it by one corner, we shall see that the little piece our finger has covered will remain as white as it was when we first took the paper out of the packet. This is because the light could not reach the place which was shaded by the finger.

When we have done this we shall understand what photography really is. We shall see that we have a wonderful kind of paper which turns black when it is taken into the daylight; and, if we shade some parts from the light, those parts will remain white while the rest of the paper becomes dark.

Now we can see that if we lay a leaf or a small flower on the paper, and leave it in the light for a little time, we shall get a perfect copy of that leaf. That is the way the photograph of leaves on the next page was taken.

Of course we shall find that the leaves, when we first pick them, are crinkly, and will not lie flat on the paper. We must press them closely to the paper by putting a piece of glass over them if we want our photograph to be clear.

The best way is to get a small piece of glass about five inches long and four inches wide. Probably we can find a piece in the house. A glass from an old picture or photograph frame will do quite well. Then we should cut a piece of thick cardboard the same size as the glass, and get two strong elastic bands to hold them all together.

Now, whenever we want to photograph the leaves we lay them first on the glass, then put a piece of the paper over the leaves, and the cardboard over the paper. The two elastic bands slipped over the glass and paper, in the way that is shown in picture 1, will make everything ready for taking the photograph.

We have now only to take it all out into the light, and leave it in the sun until the paper seen through the glass has turned quite black. Then we must take it indoors,

and when we slip off the elastic bands we shall find a wonderful picture of the leaves, with all the delicate veins showing clearly.

Now, we must understand that this picture has appeared in this wonderful way because the leaves have shaded some parts of the paper while the other parts have been getting quite dark. If we take our photograph out into the daylight again, it will become dark all over, and the leaves will not show any more. We do not wish this to happen, so we must do something else before the photograph is really finished.

We must use some of our hypo. This stuff looks something like the soda we have seen in the kitchen. Well, we must take some of this hypo—about two teaspoonfuls will be enough—and put it into a soap-dish and pour some water on it. In a little time the hypo will dissolve in the water, and then we must put our photograph in it and leave it there for ten minutes. It will turn red at first, but will afterwards get dark again. When this is done, we take the photograph out and put it into a basin of water.

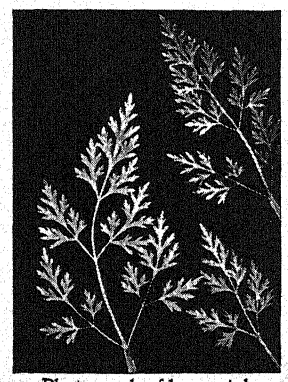


3. A portrait taken without a camera.

It is best to leave the basin under a tap in the sink, and let the water run into it for two hours; or, if we have a washhand-basin with a tap over it, we can put the photograph into that. It must be washed in clean water for at least two hours, or it will not last. We have now only to take the photograph out and let it dry, and it is finished.

When we have done one, we shall probably like it so much that we shall want to do a lot more, so we must look for new things to photograph.

Perhaps when we were at the seaside last summer we brought back some pieces of that pretty pink seaweed. If so, we shall find that this makes lovely photographs. Some kinds of feathery grass make very pretty pictures, too; and little pieces of fern look lovely if arranged so that they group nicely before the photograph is taken.



4. Photograph of leaves taken without a camera.

We know one boy who is so fond of making these pictures that, whenever he goes out into the country, he brings home leaves from the different trees he sees. Then he photographs them, and puts the pictures into a little album, and underneath he writes the name of the tree each leaf came from.

Of course, there are lots of things that one can photograph besides leaves and flowers. We can copy pictures of people or outdoor scenes. Any picture from a book or a magazine can be photographed without a camera, if it has been printed on paper that is white at the back.

In THE BOOK OF KNOWLEDGE you will often find a colored picture in the volume. We can make a photograph of one of these very easily. All we have to do is to take the colored picture and put a piece of self-toning paper against it. Then we put them both between the glass and the cardboard, exactly as we did with the leaf or fern, and leave it all in the sunlight.

When we take the paper out, we shall find a copy on the self-toning paper. We shall, however, find that the black lines of the picture are white in the photograph; and if we do not like this we must take another photograph from our photograph, and then everything will be right. We shall have a real copy of the picture, with the dark parts dark and the light parts light, just as they should be.

When our friends see how well we can take these photographs, they will probably ask if we cannot copy some portraits for them. This is just as easy if the portraits have not been stuck upon cardboard. If they have been "mounted," as photographers say, we must first soak them in water for a few hours, and then peel them off the card. Then, when the portraits are dry, we can use them just as we used the pictures from THE BOOK OF KNOWLEDGE, and we shall be able to do just as many photographs of our friends as we want.

Remember, for copying other pictures we must take two photographs, because the first one shows the faces black. This first photograph that we get is called a "negative"; but when once we have taken it we can make as many photographs from it as we please, and the second ones will be just like the real portraits which our friends lent us in the first place.

ANSWERS TO THE GAME OF "WHY IS IT?" ON PAGE 2588

1. The space allows for the rails to expand when heated by the summer sun.

2. The friend's image is reflected from the glass at the same angle as that of the little girl in the corner looking into the glass.

3. Rays of light from the steps and the shell did not reach our eyes in a straight line, but bent down towards our eyes on passing from the water into the air. So the shell and the sand appeared higher than they were.

4. A three-sided lustre in the glass chandelier acted as a prism and broke up the sunlight into the bars of color.

5. The call echoed from the rock on the opposite side of the valley, at an angle the mother knew would just reach her son.

6. The corner of the handkerchief acted as a siphon, and the scent passed up along the threads in the material and down into the rest of the handkerchief.

OTHER PIECES OF BOX FURNITURE

WE can hardly decide which of these articles we want to make first. Shall it be the flower stand, the shirt-waist closet or one of the others? It certainly is not easy to choose, for they are all attractive and we shall want to make them all in time. We are becoming skilful carpenters, for our journey into Box Furniture Land has given us experience with many articles. We have finished a scrap box, a foot-stool, a general utility box, among other articles, and now we shall attempt some pieces of furniture which are just a little more difficult. The distinctive feature of our furniture is the corner brace or trim. And this, we remember, is always made by placing the face of the wide strip of wood at right angles against the edge of the narrow one. Full directions are given under each article, so you will have no difficulty in making them. All ready now with our boxes!

A FLOWER STAND

"HURRAH for Billy," said Mother, when her son presented her with an artistic flower stand with a plant on it, as a surprise for her birthday. "For a long time, I have wanted just such a place to have for my geraniums, and now I have one that is made so nicely." "I knew you would be surprised," replied Billy, "because we have kept it in the garret and worked on it while you were away, and all the materials and the plant included were bought with the twenty-five cents you gave me for having a good report card." "How did you make it?" asked Marjorie, his cousin, who was visiting him. "I wish I could make one for my Mother, too." "It's easy enough," said Billy. "I'll tell you."

Materials Needed.

"The grocery boy brought his order one morning in a good-looking candle box, and I asked him to leave it. He did so. Then I went to the carpenter's shop around the corner and asked him for material for the legs. As the box was 14 inches square and 7 inches deep, I wanted four strips, ⅜ inch thick, 1¼ inches wide and 9 inches longer than the outside depth of the box; and four more strips ⅜ inch thick, 1½ inches wide and 9 inches longer than the outside depth of the box. Besides this I needed two pieces for cleats to strengthen the shelf, and so asked for two strips ½ inch thick, 1½ inches wide and 14 inches long."

Directions for Making.

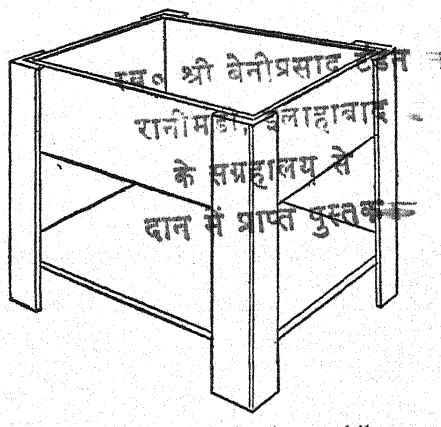
"It's the easiest thing in the world to make," said Billy, "but I'll write out the directions for you, so you will not have the least bit of trouble." So Billy wrote down on a large piece of paper just the way that Marjorie ought to make the flower stand. And here is what he wrote:

"Take the cover off the box. Don't sit on it, for you will want it in a jiffy. Use a tack-claw in pulling out the nails. Don't split the wood by jerking them out in a hurry.

"Get your big sister Nan to help you on the next part, because two can have more fun than one. Here's the leg job.

"Put the four narrow strips in one pile (Pile No. 1), the four wide strips in another group (Pile No. 2). Take a narrow strip from Pile No. 1. Put it flat down on the floor in front of you. Take a wide strip from Pile No. 2. Stand it up straight on one edge, bang up against No. 1, but not on top of it. That's what you call a right angle. You'll know that when you study Geometry. Now then, Marge, while Nan holds the two pieces together, hammer the nails in. That makes one leg. Make three more just like that. That stunt is done. Hurrah!

"Turn the box on its side. Let Nan hold one leg in place, keeping the upper end even


स्व० श्री बेनीप्रसाद टंडन
रानीमंडी, इलाहाबाद
के संग्रहालय से
दान में प्राप्त पुस्तक

with the open top of the box, while you get busy with your hammer and nails. Nail on all legs.

"Now, where's your cover? Find it and plane off the good-looking side. Turn it over and nail on two strips for cleats on the wrong side. Call it a shelf.

"Turn your stand upside down; set the shelf in place, making it four inches from the end of each leg. Put two nails through each leg into the edge of the shelf. Don't let the shelf slip while you drive your nails.

"So far so good. Take a piece of coarse sandpaper, and rub the stand all over, then take a piece of fine and give the finishing touches. Now for a small can of Jap-a-lac. All girls love to flourish a paint brush. Put on one coat, let it dry over night. Then sandpaper it a bit and apply a second coat.

"Now then, Cousin, your job is done. So give a war-whoop, and dance a jig around your flower stand.

"Perhaps you can get a pan which will just fit inside, so that if water slops over it will not make the bottom wet so that it will warp."

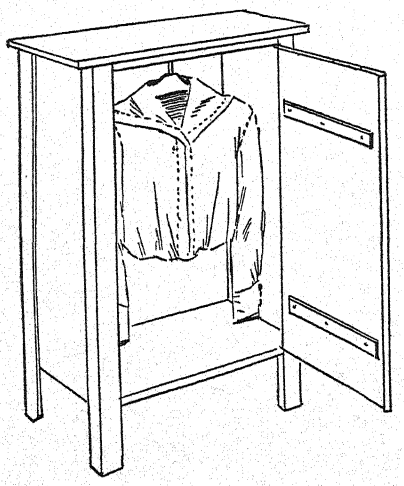
Copyright, 1918, by M. Perry Mills.

SHIRT-WAIST CLOSET

A SHIRT-WAIST closet is quite an inexpensive bit of furniture, and yet it is very useful and attractive. The carpenter lad in his work must not forget his big sister who sometimes helps him in his studies, nor the good Mother who constantly takes many stitches for him. So this chest is something which the boy can make especially for his grown sister or his Mother, and he may be sure that it will be appreciated. It is a novel idea to have a special closet for blouses to keep them fresh and clean. A bureau drawer is the usual place to keep waists, but very often the blouses get crumpled, mussed and wrinkled. A shirt-waist closet would delight the heart of a school-girl, and it certainly is not hard to make, if you start with the box as a foundation. So, girls, if you have not a big brother, get to work yourself and surprise your friends with your ability as a carpenter.

MATERIALS NEEDED.

The packing box necessary should be about 12 inches deep, 22 inches wide and 34 inches long. If you prefer, you may find a box



that is deeper so that it will hold several more shirt-waists.

The door is made from the cover of the box, but you will need door-cleats, or strengthening pieces, consisting of two strips ½ inch thick, 1½ inches wide, and 4 inches shorter than the outside width of the box.

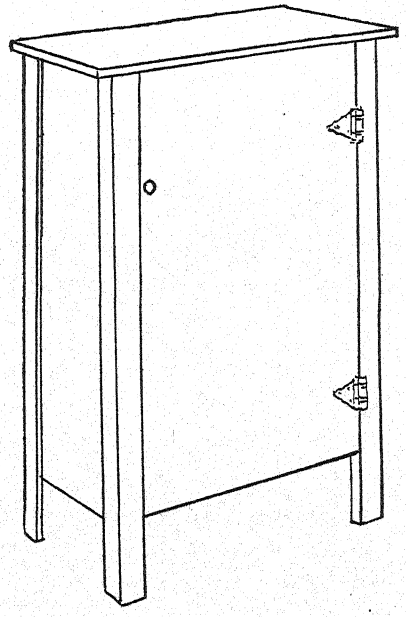
The top should be a piece of wood ½ inch thick, 3 inches wider and 3 inches longer than the outside width and depth of the box.

Again we need to go to the hardware store, and this time we want two 1½ inch T hinges and screws; one porcelain pull-knob; one brass button and screw; six wire hooks; and six coat hangers.

The last thing needed is material for the legs. Four of the strips required should be ½ inch thick, 1½ inches wide, and 4 inches longer than the outside length of the box; the other four strips should be the same thickness and length, but 2 inches wide.

DIRECTIONS FOR MAKING.

You may think that a closet is more complicated to make than the articles which you have already made, but in reality it is very simple to construct. By this time you have become an expert in the matter of making the legs, which is the distinctive feature of this style of furniture, so you will hardly need to be told how to make them. Just remember that the legs are four inches longer than the outside length of the box, and that they should be carefully planed and smoothed with sandpaper so that they will take a good finish. Remove the cover from the box; turn the box on its side and nail on two of the legs, then reverse the box and nail on the other legs. Nail the cleats on the back of the cover, which now becomes the door. Remember that the door is to swing between your strips and it must therefore be narrowed to fit by sawing off a strip 3 inches wide, or the same width in two strips.

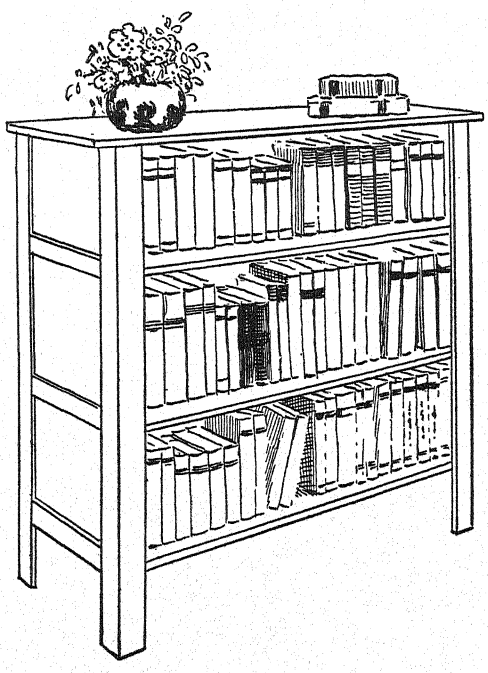


If you want to know why cleats are used, see page 1360 (in the article on joints). Place the hinges between the edges of the door and the leg, and hang the door. Turn the closet right side up, stand it on its legs, and nail on the top, letting it overlap the edges the same width all around. Screw the six hooks into the under side of the top at the centre of the closet and place a coat-hanger on each hook.

After an application or two of paint or varnish, the closet is ready for use. Just make one for Sister, and see how pleased she will be, for next to curly hair, there is nothing that a girl so much desires as pretty things for her room.

A SIMPLE BOOKCASE

OF the many attractive and useful articles which a boy can make for his own room, or in fact for the library, or for Father's den, a simple bookcase, like the one illustrated here, will well repay him for his time and energy. Every boy likes to have his own books kept together, and takes pride in adding to his collection of good books, if he has a suitable place to keep them. How many boys own a bookcase which is really their own personal property? Not many boys, perhaps; but here is a bookcase that every boy can own, because he can make it himself at very little expense. Isn't it much



more fun to make things for your room than simply to walk in a store and select something ready-made? Then there is another advantage in making your own furniture, for you may have the articles as large or as small as you please to suit the space in your room, and you may finish the articles to harmonize with your color scheme. So, boys, wake up and get some boxes. Of course, when we say "boys," that includes the girls, for the girls are often quite as capable in using a hammer and saw as the boys. And this is a secret which you must not tell, or the boys may be jealous: some girls are better carpenters than the boys.

MATERIALS NEEDED.

Of course, the first thing you need is a box; that goes without saying. This time you want a great big packing box, or canned-soup box. It does not matter whether the grocer calls it a soap box or a cereal box, as long as the size is right, and you must ask for a box about 12 inches high, 10 inches deep, and 25 or 30 inches long. You want three boxes just alike in size and shape.

For the legs, you need four strips which measure ½ inch thick, and 1½ inches wide, and 4 inches longer than the height of the three boxes combined, and four more strips of the same thickness and length, but 2 inches wide.

For the top, you will need one piece of board about ⅝ inch thick, and 3 inches wider than the outside depth of the box after the cover is removed, and 3 inches longer than the outside length of the box. For the facing strips for the sides, you must have six strips ½ inch thick, 1½ inches or 2 inches wide, and about 7 inches long.

DIRECTIONS FOR MAKING.

The materials may sound confusing, if you read them in a hurry; but if you follow the directions one step at a time, you will be surprised how easy the work will be. First of all, remove the covers from all three boxes, and smooth off any rough edges, planing them down so that they are all three the same depth. Then take two of the boxes, and place them so that they are open towards you, and nail them together. Stand them up and place the third box on top, nailing it on also, keeping the open sides facing the same way.

Make the legs in the usual way by joining a wide and a narrow strip. Nail on the four legs, keeping the upper ends even with the top side of the last box. Place the stand upon its legs, and nail on the cover for the top, letting its edges project 1 inch over the outside face of the legs all around.

Now we are ready for the facing strips at the ends which are used to cover the seams where the boxes are joined and to give a neat finish. Look at the picture to see just where the three strips are placed at one end, nail the three strips on one side, and make the other end to correspond. Now your bookcase is quite complete, and ready for the varnish or stain.

If you wish to make the bookcase look even better, follow these directions below. Before applying the varnish, you may give your work a neater finish, if you add three narrow strips of wood, each the length of the bookcase, between the front legs, and just wide enough to conceal the edges of the boxes. Nail these three strips in place, taking care to keep them exactly over the edges.

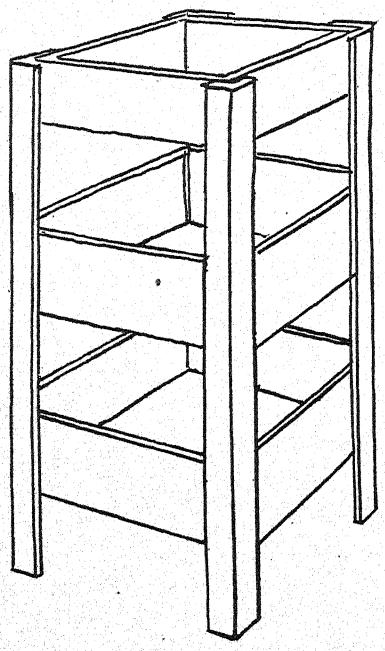
ODDS AND ENDS STAND

THIS stand will be found a convenient receptacle for all kinds of small articles, and will be useful in almost any upstairs room. In the boy's room, it will serve as a place to keep some of his smaller toys and games; in his sister's room, it will prove an attractive sewing stand; in the nursery, it will make an ideal stand for the baby's play-things and necessary medicines. There are countless ways of using this bit of furniture, so, boys and girls, get busy with your tools, and see how nicely and quickly you can make this model.

MATERIALS NEEDED.

Just as a good cook gathers all her required utensils and materials before starting to bake a cake, and a general summons all his troops before going to battle, so the efficient carpenter mobilizes his forces before setting out to conquer. In this case, the carpenter's boxes are the veteran forces, and the rough boards, his raw recruits, which must be trained and drilled into serviceable material.

The carpenter captain selects good sturdy boxes that will withstand the wind and weather, discarding any battered or fragile boxes which look as though they had been through the war. The ideal box



for this purpose should be about 8 inches high, 14 inches long, and 12 inches wide. A box that has served its apprenticeship as a bottled-bean box would make a good soldier for you. Three boxes of the same strong build will be sufficient. Four thin strips of board about ⅜ inch thick, 1 ⅛ inches wide and 40 inches long will serve as part of the legs, and four more strips ⅜ inch thick, 1 ½ inches wide and 40 inches long will be needed for the other section.

DIRECTIONS FOR MAKING.

Nail together a wide and a narrow strip to form the leg, which should be about 40 inches long. Measure to see that all four legs have the same length. Take the three boxes and remove the covers. Turn one of the boxes on its side and nail on two of the legs, keeping the upper ends of the legs even with the top of the box at its open end. Take another box and place it on its side, allowing the legs to project four inches beyond the bottom of the box, and making the open top of the box to face in the same direction as the open top of the first box. Measure the space between the top and bottom box, and locate the third or middle box at an equal distance between the two. Nail the legs to this centre box. Turn the three boxes upside down, and nail the other two legs on the opposite side, measuring carefully to see that the boxes are equally spaced as on the first side.

The stand is completely built and ready for the finishing touches. A can of varnish or stain will work wonders on the appearance of the article. A yard or two of dainty muslin or figured cretonne, pleated and nailed at the edge of the top box, will give a pretty touch to it if Sister is going to use it as a working or sewing stand. Work out your own idea as to the color scheme and it is surprising how pretty you can make such a simple thing as an odds and ends stand.

This same design would be useful in a sick-room as a medicine table. You know that at one time or another there is illness in nearly every home, and at such a time a stand like this would save the time and strength of the nurse or those looking after the invalid. For right here on this stand the medicine bottles may be kept with no danger of falling off, and the breakfast tray may be placed on the top within convenient reaching distance of the patient.

So, you see, there are many different uses for this little stand, and you will be proud of the fact that you yourself fashioned it.

A REFERENCE STAND

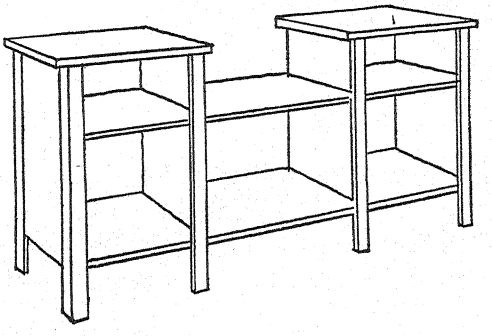
THERE are a great many things that a boy can make for the general use and convenience of all the family, and when he makes his articles out of boxes, he is especially pleased with the good results he may obtain at very little expense. Nothing that the handy boy might make would be more appreciated than the reference stand shown in the sketch. For a boy's room it would prove a veritable treasure-chest in which to keep a great variety of toys and games. One shelf might hold his tops and balls, another his camera, films, and photographic materials, while the lower compartments will be large enough for a tennis-racket, boxing gloves, or even his tools and electrical equipment. The middle compartment could be provided with a hinged door and a lock, and here the lad may keep under lock and key, his special treasures. If we should mention any further uses for this handy stand, every boy, and some girls too, would immediately set to work to make one. So while you are all eager to get busy, we shall tell you just what to do.

MATERIALS NEEDED.

We may persuade our amiable friend, the grocer, to part with three good Kirkman's Borax Soap Boxes, for if he is as abundantly supplied with soap boxes as most grocers are, he will be grateful to you for removing some extra boxes which are only in his way. However, if he has not many

superfluous boxes, he may ask five cents for each box. Any box will do that is about 11 inches deep, 15 inches wide and 25 inches long. This size is not compulsory, but is convenient. Be sure that the three boxes are alike in dimensions.

For the legs, we need four strips ⅜ inch thick, 1 ⅜ inches wide, 6 inches longer than



the outside length of the boxes; and four more strips ⅜ inch thick, 1 ¾ inches wide, and 6 inches longer than the outside length of the boxes.

Two top boards will be needed, each piece ½ inch thick, and 2 inches wider than the outside depth of the box with the cover removed, and 2 inches longer than the outside width of the box.

Besides the legs, it will be necessary to have four facing strips for the inside supports, and these pieces must be ⅜ inch thick, 1 ¾ inches wide, and 6 inches longer than the outside length of the long boxes.

DIRECTIONS FOR MAKING.

Make the legs first, and see that they are 31 inches long, or 6 inches longer than the length of the boxes. Then remove the covers from the three boxes. Take off one end from each of two of the boxes, reserving these ends for use later on as shelves in these boxes. Stand these two boxes upright on end, placing the third box lengthwise on its side between them. Mark the right height for the shelves, so that they will be level with the top of the middle box which is placed on its side. Nail the two shelves in place at this height. Now fasten the three boxes together, taking care that the open compartments all face the same way. Study the picture before you start to nail, and you will see just how the boxes are placed. Fasten on the four legs, one on each outside corner, taking care that the upper ends are even with the top edge of the end sections of the stand. The two top pieces may now be placed on the end sections, so that each top projects ⅝ inch over the outside face of the legs at the front, rear and end. Nail on the four inside facing strip legs, two on the front, and two at the corresponding points on the rear side, so that the joints between the boxes are covered. As usual, sandpaper, putty up any cracks or imperfections, and varnish in the color you prefer.

THE THINGS YOU HAVE LEARNED

WE have now learned a great deal about the possibilities of the ordinary boxes we can get from the grocer, and how they can be transformed into both useful and ornamental pieces of furniture. You have been told about the tools, and how to use them, have learned of the materials needed, and have been told the way to use stains and varnishes to make your work look better.

Our first effort, you remember, was the Miniature Plant Box, which is made so easily, and yet looks so well. We followed that with the Scrap-Box, which is a little more difficult, and showed how, with a little more work, it could be made into an attractive Hanging Flower-Box. This was followed by another Scrap-Box, which could also be used as a Hanging Lantern for a veranda or a hallway. The Footstool which came next was really no harder than some of the things which you had seen before, though you were told how you might make improvements on the simple design if you chose.

Our next group of designs was more difficult, for here we began to take our boxes apart, and change their shapes, or to put on hinges and handles. The General Utility Box is easy, if we are careful, though, of course, if we put a cushion on the top we must not make any mistakes. The useful Blacking Box requires some care, but the result is worth all the trouble. No article we have described is more useful than the Small Wall Rack, which we can make any size desired. It can be used for books, for flowers, for pipes, or the cook can find many uses for it in the kitchen.

The articles described above in this last section are rather more difficult to make than the earlier ones, but if you have practised on those which are shown before, you will have little trouble. The Flower Stand is easy, but the door of the Shirt-Waist Closet is nice work. The Simple Bookcase needs only attention to the directions, and the same is true of the Odds and Ends Stand. The Reference Stand is put last, and should not be tried until you have made some other things.

When you have made these, there is no reason why you can not make more difficult pieces either from your own or from Miss Brigham's designs, about which you were told in the first story of Box Furniture.

A USE FOR WALNUT SHELLS

OPEN walnuts carefully with a knife, so as not to break the shells, and take out the nut. Then fasten them together again with stiff gum or glue, having first put a tiny present inside in place of the nut—a china animal or doll, a paper cup folded very small, a ring, a toy insect, a chocolate, or you can write a conundrum on one slip and put the answer in another shell. These walnuts must be mixed up with a dishful of ordinary nuts.

MORE WAYS OF HAVING FUN IN THE WATER

AFTER you have learned to swim well there is no limit to the fun you can have in the water. We have already told how to do some simple tricks on page 1362. Here are some others, which you may try in the summer time, or even in a tank at other times.

WALKING IN THE WATER

Do you think that you can not walk in the water? Well, just try it, for you will be surprised what you can do. First, lie flat on your back in the position for floating, then start swimming feet foremost, using the leg action only. Quietly push one foot after the other with toes pointed, and give a downward pull, as though walking on a treadmill. The trick is not to kick the water away, but toward you. It is easy to do, but progress is slow.

ROLLING LOG

Take a position for floating again, then hold yourself quite stiff, and clasp your hands high over your head. Take a deep breath, and with a movement of the head turn over like a rolling log, and keep on revolving rapidly. This is a breath-holding stunt, so remember to fill the lungs full of air. This is easy for the fat boy, but the tall thin one will have to wriggle considerably in order to revolve swiftly.

TORPEDO

Fill your lungs with a great deep breath, take the floating position, throw the hands high above the head, and with a rapid propeller movement of the hands, shoot forward feet first. The entire body, except the toes, is submerged. It is easier to do this trick in salt water, as the fresh water has less buoyancy.

RELAY RACE

Two men who are fast swimmers act as captains, choosing teams of four men each. The captains take their places at the rear of the lines and at the signal, "Go," the first man in line dives off and swims to the stake, touches it, turns around and swims back, touching the goal. The next man in line dives in over the head of the returning swimmer, and so on. The best swimmer has been saved for the last, so the contest becomes very exciting. The team which finishes first is the winner.

CANOE RACE FOR HAND PADDLERS

Four boys in bathing suits, and two canoes are entered for this race. Two boys are seated in each canoe, one in the bow and the stronger lad in the stern. Paddling with the hands over the sides of the canoes, they struggle to reach the goal.

PEANUT AND SPOON RACE

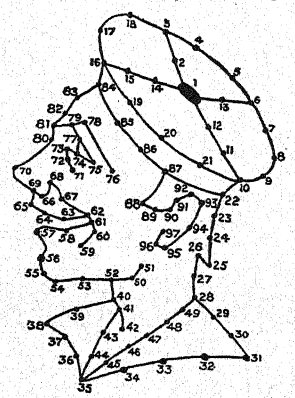
Each contestant has a dessert-spoon with a peanut placed on it, and takes his place in line in the water with the other players. With the spoon-handle in his mouth, the swimmer starts at the signal, "Go!" and tries to reach the stake, turn around it and return without dropping the peanut. If the peanut falls, the swimmer is out of the race.

CANDLE RACE

On the float or dock, set up a row of candles, with matches near by. The boys all line up in a row a few yards distant. At the signal, "Go!" the swimmers start for the candles, vying with one another in lighting them. The one who lights his candle and swims back, reaching the goal first, is the winner.

SOLUTION OF THE PUZZLE OF THE LAUGHING SAILOR

THERE are, altogether, 14 ways in which the puzzle of the sailor's face on page 2586 can be done. The dots have been numbered, and the order in which we pass them in the different solutions is as follows:



I. 1. 12. 11. 10. 22. 23. 24. 25. 26. 27. 28. 49. 48. 47. 46. 45. 35. 36. 37. 38. 39. 40. 52. 50. 51.

II. 1. 12. 11. 10. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 44. 43. 41. 40. 52. 50. 51.

III. 1. 14. 15. 16. 84. 83. 82. 81. 80. 70. 69. 66. 68. 67. 62. 61. 58. 57. 56. 55. 54. 53. 52. 50. 51.

IV. 1. 14. 15. 16. 84. 83. 82. 81. 80. 70. 69. 65. 64. 63. 62. 61. 58. 57. 56. 55. 54. 53. 52. 50. 51.

V. 1. 12. 11. 10. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42.

VI. 1. 14. 15. 16. 84. 85. 86. 87. 22. 23. 24. 25. 26. 27. 28. 49. 48. 47. 46. 45. 35. 44. 43. 41. 42.

VII. 1. 13. 6. 7. 8. 9. 10. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 44. 43. 41. 42.

VIII. 1. 14. 15. 16. 17. 18. 3. 4. 5. 6. 7. 8. 9. 10. 22. 87. 86. 85. 84. 83. 82. 81. 79. 78. 76.

IX. 1. 2. 3. 18. 17. 16. 19. 20. 21. 10. 22. 87. 86. 85. 84. 83. 82. 81. 79. 77. 75. 74. 73. 72. 71.

X. 1. 12. 11. 10. 9. 8. 7. 6. 5. 4. 3. 18. 17. 16. 84. 83. 82. 81. 79. 77. 75. 74. 73. 72. 71.

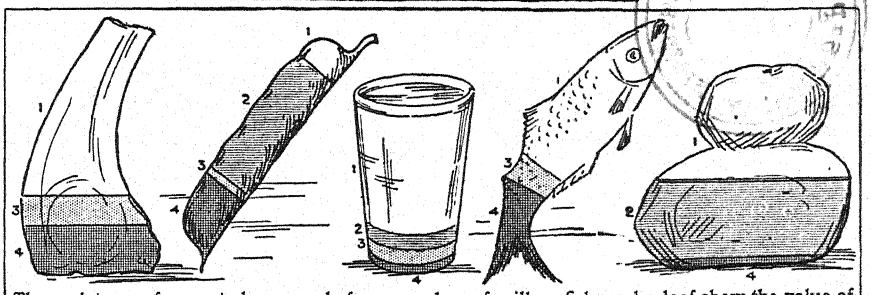
XI. 1. 13. 6. 7. 8. 9. 10. 21. 20. 19. 16. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97.

XII. 1. 13. 6. 5. 4. 3. 18. 17. 16. 19. 20. 21. 10. 22. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97.

XIII. 1. 13. 6. 7. 8. 9. 10. 22. 87. 86. 85. 84. 83. 82. 81. 80. 70. 69. 66. 68. 67. 62. 61. 60. 59.

XIV. 1. 13. 6. 7. 8. 9. 10. 21. 20. 19. 16. 84. 83. 82. 81. 80. 70. 69. 65. 64. 63. 62. 61. 60. 59.

THE NEXT THINGS TO MAKE AND THINGS TO DO ARE ON PAGE 2805.



These pictures of a meat chop, a pod of peas, a glass of milk, a fish, and a loaf show the value of these foods to the body. The parts marked 1 are water; 2 and 3 are carbohydrates and fats, which give the body energy and warmth; and 4 is proteid, which rebuilds the body as it wears out.

FOOD AND ITS USES

CONTINUED FROM 2650



WE have already seen that muscles are the furnaces where fuel is turned into work, and the ordinary name for muscle-fuel is, of course, food. By far the greater part of the food which we daily consume is for the use of the muscles, including the heart and the muscles of breathing, as well as the muscles of locomotion, and of the arms. Now, we have already learned something about the machinery which exists in our bodies for taking in food and changing its useful parts, so that they can enter the blood and be carried by it to every part of the body. And here we must go on to find what food is made of; to learn what it is that makes bread a good food, and firewood no food at all; and how we may be guided in our choice of what we eat.

First, as the body is a furnace and a machine, which makes power or work out of fuel, it must be supplied with something that will burn, and with enough of it. The fuel supplied must not merely be burnable outside the body, when a flame is put to it, or when it is thrown into a furnace, but it must be burnable inside the body, at the temperature of the body, which is very low compared with that of even a tiny flame. Now, firewood will burn—that is to say, the elements of which it is made are not combined with as much oxygen as they would like, and will take more if they can. But firewood will not burn at the temperature of the body—or, indeed, at temperatures a great deal higher. So, though it is fuel for a furnace, it is not a fuel or food for man. The same is true of coal. It consists mostly of carbon, and our bodies burn large quantities of carbon every day; but coal, as charcoal, will not burn at the low temperature of the human body. We may take charcoal powders, and eat charcoal biscuits, but not a single atom of the carbon in them combines with oxygen in our bodies. It may be a medicine, but it is not a food.

Suppose, now, we knew that the body must have carbon to burn, and had to find out how to give it the carbon it requires. Wood, coal, charcoal, we find, are useless, if we try them. Plainly, we must try some of the compounds of carbon, compounds which contain less oxygen than will satisfy the atoms in them. Carbon dioxide, for instance, would not do, for that is fully burned up already. Now, one of the cheapest compounds of carbon is starch, and perhaps that will meet the body's need. We think of starch as something to make clothes stiff, but it is one of the most important of man's foods.

Knowing, as we do, that all the world of life is knit into a whole, that animals depend on plants, and plants on animals, we should expect starch to be useful, when we know that

every green leaf everywhere is making starch whenever light falls upon it. If you take a leaf, before sunrise, and clamp a little part of it with a pair of flat corks, and then, at the end of the day, take the corks away, wash the leaf in alcohol, and add a little iodine to it, the whole leaf will turn blue except at the spot which the corks covered. That spot will be white. The reason is that the leaf has been making starch in itself all day, except where the corks prevented the light from reaching it. The alcohol washes away the green chlorophyll from the leaf, and then the iodine, which is the test for starch, reveals it by turning the leaf blue where starch is present. Do not apply this test for starch by spilling tincture of iodine over a shirt-front; but if you do so accidentally you will have no doubt about the blue color made when starch meets iodine.

This experiment is worth describing here, even although we are talking about food, because it is possible to measure how much starch the leaves make.

THE GREEN LEAVES THAT ARE ALWAYS AT WORK FOR US

We know how much starch we require every day, and so it is possible to say how much foliage must be at work every day for every human being, not to mention the lower animals. One square yard of leaves will produce about fifteen grains of starch in an hour. If you and I are to get all the fuel we need to-morrow, each of us requires to have 500 square yards of leaf working for an hour—or, say, 100 square yards working for five hours. That, we understand, is just an average. The exact figure would vary with the intensity of the sunlight falling upon the leaves, the amount of work we did in the day, the size of our bodies, and so on. But it is well that we should think of ourselves as daily dependent upon a multitude of green leaves somewhere, which are translating the energy of sunlight into a form that we can use.

But if we take starch outside the body, and heat it in the air to the temperature of our blood, we do not find that it burns. The same is true of sugar and bread and meat, even when they are completely freed from water. Yet all these things burn inside the body, and are foods just because they do so. We find that the body has within itself the power of causing things to burn under conditions of temperature, and so on, in which they would not burn outside the body. This is done by means of chemical substances called ferments, which exist in the blood and in every living cell in the body.

So far we have thought of food as simply fuel for our engines, the muscles, that have work to do. But the food has other uses, and we need other kinds of food besides those that are simply fuel.

THE FOODS THAT FEED THE FURNACES OF OUR BODIES

These other kinds of food we must learn about, but we have purposely begun with the question of fuel-foods, because by far the greater part of the whole bulk of our food is required as fuel; and also because we know more about the uses of food as fuel than we do about its other uses. We must also recall what was said on page 2648 about the contraction of a muscle. The furnaces of the human body are required not only to produce work, but also to produce heat. Thus we owe to the burning of our fuel-foods all the work done by our muscles, visible and invisible, and all the heat which is made by our bodies. It is these two needs that account for the great quantity of fuel we require, and for the frequency with which the supply of it has to be renewed. If it fails, our temperature very quickly begins to fall.

But now we can look at foods more generally, to see what other purposes they serve than those of fuel. Let us consider our bodies, and ask what are the things that they get every day from outside themselves. Let us mention everything, whether we are accustomed to look upon it as food or not.

THE VALUE OF AIR AS FOOD, AND HOW WE MAY HUNGER FOR IT

The things that our bodies receive daily from the outside world are: air, water, light, salts, fuel-food, and proteids.

1. AIR. We do not think of air as a food, yet there is no more reason for calling the carbon food than there is for giving the same description to the oxygen which is to combine with the carbon in our bodies. Any proper idea of what is meant by food must certainly include air, or, rather, oxygen. It is incessantly being used up in our bodies, and new supplies are always needed. It is possible to be *hungry*, too, for this very valuable food; and in some kinds of illness, where enough oxygen can hardly

get into the blood, it is terrible to watch the unhappy person's "air-hunger," as the Germans quite properly call it. People are very likely to have fads about their food. It is a pity they cannot learn to be more particular about the quality and purity of their air-food, or of that which they condemn other people to live upon.

ALL OUR LIVES ARE LIVED, AND MUST BE LIVED, IN RUNNING WATER

2. WATER. The second thing which our bodies receive every day from without is water. We do not often think of this as a food; but there we are wrong. By far the greater part of our bodies consists of water; and it is a specially notable thing, as true of an oak or a microbe as it is of ourselves, that, for life, there must be a ceaseless circulation of water. Not merely is all life lived in water, but it is all lived, and must be lived, in *running water*. No matter what kind of living creature we examine, we find that it is always *giving off water*, and unless this loss is supplied it will soon cease to live. Few things in Nature are more wonderful than the giving off of water—a sort of perspiration—by the leaves of a plant, and the way in which the roots drink the water from the soil and send it up to the leaves. But we too are constantly losing water. On an average each one of us loses about six pounds of water every day of our lives by the action of the skin, the lungs, and the kidneys. Of course, this means that the same amount of water must be taken into the body somehow every day; and thus there is no more necessary or important food than water.

THE GREAT NECESSITY FOR WATER AND THE TERROR OF THIRST

We can learn a good deal from the very unpleasant feats performed by fasting men. If a man can store up in his body anything he needs, then he can do without fresh supplies of it for a time. We cannot store up oxygen to last us for more than a few minutes. But we can store up enough of the fuel kind of food, especially in the form of fat, to last quite a long time. A man may go quite without eating for forty days, but that is because his body is, during all that time, using up the fat that it has stored. But no man can store up water in his body, and so the fasting man always has to be allowed as much of this food as he pleases, just as he has to be allowed oxygen. Not even the fasting man, then, is an exception to the universal law of all living matter, that it must have an unfailing supply of fresh water supplied to it, in order to keep going that stream of water in which all life everywhere is lived.

This helps us to understand how it is that thirst is so terrible, and why living creatures, suffering from thirst, will drink the most horrible things if there is no other way in which they can get water. We understand, also, why madness follows upon lack of water after a very short time, as we know in the case of shipwrecked sailors. Children live very quickly, so to speak, for they are naturally very active, and, unlike grown-up people, they are growing fast. They need a frequent supply of water, and suffer very severely if it is not forthcoming.

THE POWER OF WATER AND LIGHT AND SALT IN KEEPING US ALIVE

There are few things more cruel than to deprive a child of water, or to expect it to learn its lessons well when it is thirsty. A child's brain cannot act properly if the blood does not carry sufficient water to it. Doctors, also, have lately learned that, when Nature demands water for a feverish child, Nature must be obeyed.

In most books water is not reckoned to be a food because it is not burnable—it is, of course, already burned—and because it does not go to make any of the tissues or stuffs of the body. But, as every living tissue is itself built up and lives on water, and as this water must never be allowed to become stagnant, it is plain that we ought to regard water as one of the most important of all foods.

3. LIGHT. Another of the things that enter our bodies is light. Under this we may include not only the visible light that strikes the eyes and the skin, but also all kinds of invisible radiation from the sun and from the atoms of the air, which also strike and enter our bodies. These things have power and energy in them; they do enter our bodies; and we know that nothing is ever lost. Something must happen to them, and the fact that they enter the body just as surely as air, or water, or bread,

does, should not be forgotten. Up to the present, however, students of the body have not studied this subject.

4. SALTS. The case of the salts proves to us at once that a thing may be a food even though it supplies no power to the body, not being burnable food, and even though it does not make tissues. Certain salts are absolutely necessary for life, and as they pass by no means slowly away from the body, the supply of them needs to be constantly renewed. We do not yet know nearly all their uses in the body, but we know some. Several kinds of salts are necessary, though there is only one kind—common salt, or sodium chloride—that we actually add to our food. The other kinds are sufficiently supplied by their natural presence in food. We need calcium salts, for instance, and there is actually more calcium in milk than there is in lime-water. Vegetables and fruits are principally of value because of the salts they contain. When we cook a cabbage we dissolve into the water the most valuable part of it—the salts it contains—and then throw the water away! Meat also —that is, the muscles of ox or sheep or pig—contains a great deal of salt; but of all our food-stuffs fruit is best so far as salts are concerned.

THE USES OF SALT AND THE PART IT PLAYS IN OUR LIFE

We look upon common salt as a thing with which to flavor food, like mustard and pepper. But, while these are not foods, salt is a necessity of life. Not only does it play a necessary part in the blood and the tissues, in a way we do not yet understand, but it is perhaps the source of one of the important products of the stomach, without which the digestion of our food would be difficult. We remember that common salt is sodium chloride, and it therefore may be the source of the hydrochloric acid which is poured into the stomach some twenty minutes or half an hour after every meal we eat.

If the body of an animal or a human being be burned, we find that there is always left an ash; and this ash consists of the salts that were in the body and that cannot be burned. Important among them would be the salts of calcium, which give strength to the bones and to the teeth. If a bone be placed in an acid, and the salts melted away, the bone becomes quite soft, and can be tied into a knot. So these salts are specially important as part of the food of babies and children who are making their bones and teeth. Salts of iron, too, are necessary for the blood, and it is easy to prove that there is a rich and constant supply of salts of iron in milk.

THE THREE FOODS THAT MAKE UP THE CHIEF PART OF OUR DIET

5. FUEL-FOODS. And now we come to the foods which make up the bulk of our diet, and are all burnable. They are of three kinds and no more—*carbohydrates*, *fats*, and *proteids*. Carbohydrates is the name given by scientists to compounds containing carbon, combined with hydrogen and oxygen; and proteids are the important compounds containing carbon, hydrogen, oxygen, nitrogen, and sulphur, that are found in all animals and vegetables. Of the three foods, the first two—carbohydrates and fats—are pure fuels and nothing else; they are burned in the body, making heat and power. The fat can be stored in large quantities, and the body can turn either carbohydrates or proteids into fat if it desires to store them up, as often happens when we eat more than we have need for. But the body cannot store up carbohydrates in quantity, and cannot store up proteids at all. Here it differs from the body of a plant, for that can store up its food as a carbohydrate—starch. The wax which bees make out of sugar is a carbohydrate—sugar—being turned into a fatty substance.

THE FUEL-FOODS THAT GIVE US HEAT AND POWER

Most of the fat we eat is of animal origin, such as the fat of meat, the fatty part of the yolk of an egg, and the fat in milk, cream, and butter. All these forms of food are expensive compared with most vegetable food, and it is the vegetable world that gives us most of the carbohydrates we eat—sugar and starch. It seems to matter nothing at all to the body whether its fuel be supplied as fat or as carbohydrate; but perhaps sugar, if not starch, has the advantage over fat, that it is more easily digested, besides being much cheaper. There is no doubt which Nature prefers for children; though, if we are careful, children will take more

fat than is sometimes supposed. The best form of fat for children is also the dearest—cream.

Unlike any of the things we have mentioned hitherto, such as air, water, and salts, the pure fuel-foods, sugar, starch, and fat, are not necessary for life. It is possible to live without ever taking the smallest quantity of any of them. This is so because it is possible to burn proteid food, and use it as fuel. Fuel, of course, we must have in some form or other. But it would be very unwise for anyone to use proteids only as his fuel-food, and to give up the carbohydrates and the fats. In the first place, the proteids are very much more expensive; secondly, they require much more digestion, on the whole; and thirdly, when the proteids are used as fuel-foods they do not burn up completely into water and carbon dioxide, as fat and sugar do, but they produce all sorts of other substances which it is very bad for the body to produce in it from day to day. In time they poison the body and make it "old," as we say; and that is what happens to people who live to eat, and so do not take a natural diet, with a natural balance of the various kinds of food in it.

THE FOOD THAT BURNS AWAY OUR BODIES AND THE FOOD THAT REBUILDS THEM

For immediate result, and simplicity of digestion, sugar is undoubtedly the best fuel-food. That is why children, who are so active, and are specially in need of heat-producing foods owing to their small size, are naturally fond of sugar and sweet things. If a child is always allowed just as much sugar as it feels inclined for, it is not likely to make itself ill with eating too many sweets, as children do who have been starved of sugar.

Now we may leave the carbohydrates and fats, remembering that while they must take a second rank as foods because it is possible to live without them, yet they are exceedingly useful and valuable; and probably to take more of them than we really need is not nearly so harmful as it is to take more than we need of proteids.

6. PROTEIDS. Proteids are the last class of foods that we need, and there is something special about them which, in a way, raises them above all other foods in importance. We have described the body as a sort of engine which needs fuel, and so it is. But it is a living engine, which itself is burning and being destroyed from day to day. If it is to go on living, as, indeed, it does so well that no engine made by man can compete with it for lasting power, it must be supplied with food which will make good its wear and tear; and the only food which will do this is proteid.

THE FOOD THAT EVERY LIVING CREATURE NEEDS TO REPAIR ITS BODY

Every living creature requires a supply of proteids to make good its wear and tear; but only one kind of living creature, those that have chlorophyll, can make proteid for themselves. All others, including all the plants, like mushrooms, that have no green chlorophyll, and all animals and human beings, must have ready-made proteid supplied to them. There are many different kinds of proteids, but most of them are suitable food for us, whether they come from the animal or the vegetable world. They are changed by digestion into the special kind of proteid that is found in our blood.

However richly a man may be supplied with water, salts, starch, sugar, and fat, he cannot live without proteids. But we should clearly understand that the proteid is required not as fuel, for sugar and starch are better fuels, but as a means of repairing the body waste. Proteid can be used as a fuel if necessary, so that it is possible to live without fats or carbohydrates, as we have seen. Very many people take far too much proteid food, especially in the form of meat. They take it simply because they like it; but they do not know the consequences.

HOW POISON MAY COME INTO OUR BODIES THROUGH OVER-EATING

If sugar and starch and fats are taken in excess, they can be stored up as fat. It is a peculiarity of proteid that it cannot be stored. It must either be used, or broken up and got rid of; and that is what happens when we take more proteid than we need, as most well-to-do people do every day of their lives. Unfortunately, the breaking-up of proteid in the body is a difficult business, proteids being enormously complicated compounds, and many of the products of this breaking-up are mild poisons. If they are being continually

produced in the body, they gradually injure the health of the blood-vessels, and of the kidneys, skin, and other parts of the body which are concerned in getting rid of them. This is a very serious matter, and explains why continued over-eating produces its very evil consequences.

THE AMOUNT OF FOOD WE NEED AND THE CLOTHES WE WEAR

Of course, we ought to know about how much of these various things are required in our food every day. What we need varies very much according to many circumstances. In the first place it is certain that some people are more economical with their food than others; they can get out of a small diet as much work as other people will get out of half as much again. These are natural differences which cannot be explained. Also the size of the body affects its needs very markedly. The Japanese have small bodies, and apparently, as a race, are able to make a little food go a long way, even apart from the fact that they are small. In the Russo-Japanese War, one of the great advantages enjoyed by the Japanese was that their soldiers required very little food, while the Russians required a great deal.

Climate and clothing also affect the amount of food we need. In warm air we lose heat less rapidly, and so we require much less fuel. Our appetites are naturally lessened in hot weather, and if we are wise we respect the warning. If we are foolish we try to cheat our appetites with dainties. In very cold climates large quantities of heat-producing food are needed. Thus, the Eskimo lives largely on blubber, which is fat. Similarly, other things being equal, the more clothes we wear the less food we need.

HOW THE WEIGHT OF FOOD A MAN EATS DEPENDS UPON HIS WORK

Muscular work very greatly affects the quantity of food we need. This, of course, we know, must be so. The appetite of men doing really hard muscular work is very great. It has to be, if sufficient fuel is to be supplied to the muscular engines. Mental work scarcely affects the amount of food needed.

In all these cases, it is the quantity of the heat and work foods—fat and carbohydrates—that should vary. Circumstances do not affect so much the need for proteid food. Here are some figures giving an idea of the quantities of food required. A soldier is allowed, in this country, a pound of bread and three-quarters of a pound of meat a day, together with additions like salt and so on. When he is on active service he is burning more fuel, and so he is allowed one and a quarter pounds of bread and a pound of meat. Of course, these weights include a good deal of water; and in our food in general, not only is there naturally a great deal of water, but there is also a proportion which cannot be digested and is only waste matter. So the figures showing the weight of the food a man eats in a day are very different from those showing the quantities of actual food material by which he lives.

An average diet for a man would be about six pounds of water, one ounce of salts, fifteen of sugar or starch, three of fat; and as to proteid, probably three ounces is abundant, though twenty years ago a much higher figure would have been named. The quantities of all foods but proteid must be increased for severe labor, and very much lessened if a person is going to stay in bed.

WHY A BOY MAY REQUIRE MORE FOOD THAN A MAN

Of course, the figures vary in proportion to the size of the individual; but a small man requires far less food than a boy of the same weight. In other words, children need a quantity of food quite out of proportion to their weight, for while adults merely have to maintain their bodies, children are *making* their bodies. Children, therefore, require not merely a large supply of food in proportion to their weight, but they require a specially large proportion of proteid, for proteid alone, as we have seen, will actually make a living tissue. When we come to study the more important foods, we shall see how carefully Nature has supplied this need for proteid, in the food which she prepares for young human beings, and for all the young animals that belong to what are called the mammalia. Another special need of children is calcium, for bones and teeth; and so we find milk rich in calcium, and should give children plenty of foods that are rich in calcium, such as eggs and oatmeal.

THE NEXT PART OF THIS IS ON PAGE 2827.

WHAT THE WISE MAN TELLS US

IN this part of the Book of Wonder the Wise Man tells us many things we have often puzzled our brains about. He tells us why it is that we dream, and says that no dream has any particular meaning, and that all our disagreeable dreams or nightmares merely arise from indigestion or some other disturbance in our system; he tells us why sleep-walkers sometimes walk in the most dangerous places without being hurt; why the moon appears to travel with us when we walk, and why its reflection follows us on the sea; he tells us what makes such pretty dimples in smooth, round cheeks,—angel's kisses, we sometimes call them, but have we ever thought of their natural cause? Moreover, and besides all this, he informs us why we sometimes feel afraid when we do not wish to do so, and why the fear of the dark and of loud noises is so strong in little children.

WHY DO WE DREAM?

CONTINUED FROM 2655

THE brain has many parts, and some part of it may be asleep, while another part is awake and active. That is what happens when we dream. Most of the brain, especially the highest part of it, is asleep in a dream, but parts of it are awake, and these, unguided by the highest powers of the mind, work on the materials of past experience, especially recent happenings. Perhaps only the very deepest sleep is entirely free from dreams, and it seems certain that most of us have dreams of which we remember nothing when we wake.

The more vague and shadowy and the more easily forgotten a dream is, the fewer are the parts of the brain that have been awake; but when we have long and complete dreams, very clear, and very clearly remembered, then it is probable that more of the brain has been awake. The fewer dreams we have, the better it is, for that means that our sleep has been more complete; and if we are to have dreams, it is best to have the kind which are scarcely remembered. *No dream has any meaning about the future.*

WHAT IS A NIGHTMARE?

By far the worst kind of dream is a nightmare—a dream which seems very real, and is intensely horrible or frightening. When nightmares occur often they should be attended to. They may be due to illness such as heart disease, or some disease of the nervous system, or indigestion. Many students of this subject believe that they are caused altogether by feelings that have been aroused at some past time by an unpleasant experience such as a shock, or even by reading an exciting book, and that the thought of this, though we have forgotten it, comes back in our sleep. These students say that the best way to overcome nightmare is to fill our minds with good thoughts about beautiful and useful things, and so crowd out the ugly and hateful things. Children who have bad dreams should not read dime novels. Besides the unpleasantness of nightmares, we should remember that they mean that the sleeper is not getting sleep of the best quality, and his waking hours will suffer accordingly.

WHY DO WE DREAM WE CAN DO THINGS THAT WE CANNOT DO WHEN AWAKE?

The reason why we seem to do quite impossible things when we dream, and are never surprized at doing them, is that, when we dream, the very highest part of our brain, the

part which has to do with our knowledge of ourselves, and with judgment and with the power of distinguishing between what is real and what is only fancied, is asleep, and so is unable to do its work. When we are awake we may often "build castles in the air," or imagine ourselves doing all sorts of wonderful things; but the highest part of the brain remains active, so that all the time we know well that we are only imagining these things—not really doing them. We know fact from fancy. But when the highest part of the brain and the power of the mind that goes with it are asleep, fancy seems like fact. Sometimes, even in day-dreaming, we gradually pass from the ordinary fancies of a waking person into a state where these fancies seem real; our judging and reflecting powers have "taken forty winks." Probably all stages can be traced, from fancy which we know to be fancy, to the wildest dreams that seem to be reality.

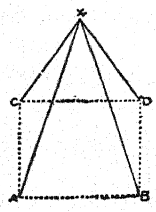
IS SLEEP-WALKING DANGEROUS?

Sleep-walking is not a very uncommon thing, though it is commoner in slight forms than it is in extreme forms. There is nothing alarming in it, and there is no reason to suppose that it does any harm to the walker. It is rather unusual, and that is the worst we can say of it. We need only remember that the best place for the sleep-walker to wake in is his bed, simply because he will not be frightened if he wakes there.

He can usually be persuaded quite easily to go back to bed—for people in his state always readily take suggestions. Their conscious mind is asleep, and does not interfere as it might if it were awake. Of course, it is possible that the sleep-walker may hurt himself, so that he should guard against such chances. Yet the sleep-walker is wonderfully careful; even if he crawls over a roof he seldom comes to harm, unless someone foolishly wakens him, for his conscious mind is asleep, and so he has no fear; and it is fear that makes the danger of many dangerous things.

WHY DOES THE MOON APPEAR TO TRAVEL WITH US WHEN WE WALK?

The moon and other objects in the sky are so far away that as we walk we notice no difference in our position compared with them. The nearer a thing is to us as we move, the more do we notice its change of position compared with ours. We can prove this by comparing the various things we see when we are in a train. The telegraph posts seem to rush past, the fields move past not so quickly, a tree on the horizon almost seems to travel with us, and the moon or the sun *quite* seems to travel with us. It is only when the road turns a little, or the railway curves, that we seem to leave the sun or the moon behind us.



The explanation of all this is simply that the eye judges, not by real distances, but by angles. Look at an object, *X*, from two positions side by side, *A* and *B*; then move nearer to the object and see it from two other similar positions, *C* and *D*. The imaginary lines joining our eyes and the object form the angles *A X B* and *C X D*, and, as we can see, the angle becomes greater the nearer we move to the object or the nearer the object moves to us. Of course, we must distinctly understand what we mean by the size of an angle, or we shall never understand this point. The size of an angle has nothing whatever to do with the *length* of its arms, but with the *width* of the *angle* between them.

WHY DOES THE MOON'S REFLECTION FOLLOW US ON THE SEA?

This is a question that has puzzled many people. It looks as if, wherever we choose to stand on the seashore, the moon throws its light on the water just opposite us, and if we move, the moon alters the path of its light on the water just to suit us. But if two people are together, and one walks and the other does not, they both see the light of the moon in the sea. And if we placed a long row of people all along the shore they would all see a line of light, and they would have to agree among themselves that *the whole of the sea,* and not merely the line of it between the moon and any one of them, was brightly lit up, as a line of it appears to be lit up to each of them. That is, of course, the fact; the whole sea is lighted as brightly as the line we see. As the light strikes the sea from the moon, it is reflected, and passes onwards in the same line, just as a ball does when it is thrown on a smooth surface.

So our eyes catch the light that rebounds from the sea straight to them, and miss the light that is reflected on either side. Move to one side, and we catch the light we missed before. And so the line of light seems to move, because as we move we see fresh lines of it. The line is broader when the sea is rough, because then many of the little waves are placed at angles, so that they turn the light towards our eyes. In the same way we often see a glint of sun or moon on the water out of the main line altogether, because for a moment a wave like a little mirror has been just so placed as to cause the light which strikes it to reach our eyes.

WHAT MAKES A DIMPLE?

In order to understand a dimple, we should know the structure of the skin and what lies underneath it. In most parts of the body the skin, with its outer horny layer, and the inner living layer, which carries nerves and blood-vessels and makes the horny layer afresh from day to day, lies very loosely upon the layer of tissue beneath it. This is a loose layer, containing a certain number of fibres running in all directions, with fat-cells lying between them in healthy people—except under the skin of the eyelids, where fat is never found even in the fattest people. A few of these fibres are attached to the under surface of the skin, so that, though we can move the skin about very freely over what lies beneath it, this movement is, nevertheless, limited.

But where there are dimples, as on the face, and often round such joints as the knee and the elbow, the number of fibres attached to the under surface of the skin is much increased, and they are rather short, so that the skin is depressed, or dimpled, at these points. We see the same thing produced accidentally in the case of many scars, which are often a little depressed below the general level of the skin because they are tacked down in the same way. But a scar differs from a dimple, as the skin over a scar has been lost, and is replaced by a new thing called scar-tissue, whilst the skin over a dimple is true and healthy skin.

IF MEN ARE GROWING TALLER, WILL THEY EVER BE TWICE AS BIG AS THEY ARE NOW?

The answer is certainly "No." Our increase in stature as compared with our ancestors is due to better conditions of life. We are far cleaner than they were, and eat more regularly. We have better and more nourishing food, and we protect ourselves better from great cold and heat. It is said that people have increased in height about an inch in 1,000 years, and this change in height is due to circumstances, and not to any change in the nature of the body. It is only that our ancestors were not as tall as they should have been, and we, on the whole, are nearer the height that we should be, though thousands of poor children are shorter than they would be if they had plenty of food and sleep.

When we go back to the earliest remains of human beings, we find that the average stature of mankind, though it varied in different races in the past as it does now, has been very constant. The ancient Egyptians of 5,000 or 10,000 years ago were rather short, just as modern Egyptians are. Men of a far more remote age, perhaps 25,000 years ago, who made the caves near Mentone, in France, were quite as tall as the modern Scot or Swede, and so on. Indeed, we learn no more important lesson from the past than that the physical type of man is very nearly fixed. It is his mind, and not his body, that grows; his skull gets bigger, but his legs remain about the same length.

WHY HAVE WE THE FEELING OF FEAR WHEN WE DO NOT WANT TO BE AFRAID?

Our feelings are not under the control of our will. There is no more important fact of human nature. Therefore, it does not matter whether or not we want to feel happy or angry or afraid, we cannot help feeling as we do.

But it is one thing to have a feeling, and another thing to show it, and it is yet another thing to act upon it. We should be quite clear in our minds as to what our wills can do, and what they cannot. As the question suggests, they cannot prevent us from having certain feelings; and they cannot give us feelings just because we wish them. But our wills can completely suppress the signs of feeling, so that a man may look calm, and speak with a steady voice, though he feels very much afraid; and, what is still better, our wills can prevent us from acting in accord with our feelings, so that, though we cannot help feeling afraid, we *can* help running away. We see, therefore, that there are two kinds

of bravery. There is the bravery of the man who feels no fear, and so does not run; and there is the bravery of the man who is terrified, *and yet* does not run. And perhaps it is finer to be afraid and yet stand, than to stand because you "do not know what fear is."

WHY ARE WE AFRAID IN THE DARK?

Children are often scolded for being afraid when they are left alone in the dark, but I am certainly inclined to sympathize with them, said the Wise Man. Fear is an instinct, and, like other instincts, it requires certain things to arouse it. The dark is one of these things. The strength of all our instincts varies in different people, and so does the degree to which they are aroused by different things; but to be afraid in the dark is undoubtedly a thing natural, or normal, to young children, and need by no means be a sign of real cowardice, or have anything to do with it.

Many students of instinct have tried to trace this fear of the dark to its origin; and though it is practically useless nowadays, we can understand that it must have been very useful indeed long ages ago, like all our instincts. It would, for instance, prevent children from straying in the dark, and would cause them to cry out so that they could be found if they were lost in the dark. Long ago, when all sorts of enemies, such as wild beasts, were lying in wait for their prey, it must have been a very good thing indeed that children should be afraid of the dark. Many grown-up people who are not cowards sometimes have the same fear, though perhaps they say nothing about it. We may be quite sure, however, of this: there is nothing whatever in darkness *itself* to make anybody afraid for a single moment.

WHY ARE WE AFRAID OF LOUD NOISES?

The fear of loud noises is a fear often noticed in children; and the interesting thing about it is that it is low-pitched noises, and not high ones, that a child fears. Often a child is made miserable by such a noise, even though it is perhaps safe in its father's arms in the daytime, and the father is making such a noise for fun. The child knows that there is no danger *really*, but this kind of noise makes it frightened, and it will beseech its father to stop. If, instead of merely laughing at such a child, we try to think what its fear means, and if we reflect that the kind of noise that it fears most is one which is like a growl, or like the deep roar of a wild beast, then we shall understand. The instincts of human beings are very deeply planted, and ages and ages do not suffice to root them out. If we study ourselves closely, and especially if we study children, we find traces of all the instincts that animals have—instincts still surviving from the time when man lived a wild life as animals do, and when these instincts were of the greatest value for his life.

WHY CAN WE NOT FLY LIKE BIRDS?

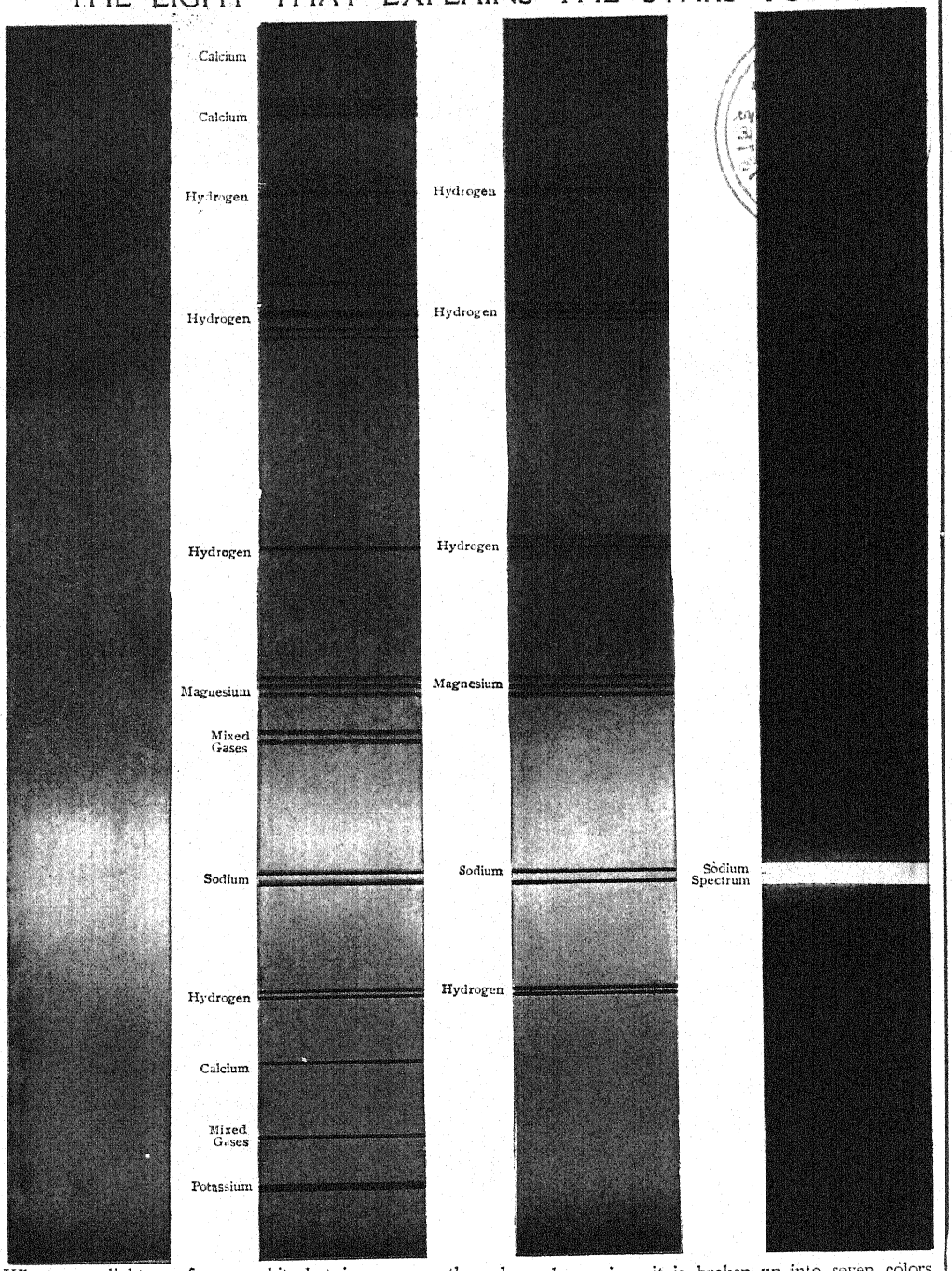
The more we study living creatures the more must we marvel at the way in which they are adapted to their particular mode of life. If, for instance, a creature is meant to fly, every part of it is adapted to that purpose. The bird's body is as light as it can be; it has large lungs to fill with air, and great air-spaces in its body besides. Then, too, its bones are very strong for their weight. The shape of its body, sharp in front and gently curved, is suited for flight. Its feathers are perfect for their purpose, and are beautifully oiled so that water cannot stick to them, for if it did it would weigh the bird down. The muscles made for flying are enormous in proportion to the size and weight of the whole bird, and they are so arranged in relation to the wings as to give the greatest possible power. The legs are of no use in flight, and are therefore made as small and as light as possible.

In the story of "Riders on the Wind" elsewhere in this book there are pictures which show how men have learned to fly. But *we* are not meant to fly, but to walk and run. We have neither feathers like the bird, nor long fingers with a membrane stretched between them like the bat. As we are meant to walk, we have strong, heavy lower limbs; the muscles of our arms are very weak compared with the corresponding muscles of the bird's wings; the shape of our bodies is not suited for flight, and so on. Our intelligence has taught us to make machines with which we can fly, but it cannot alter the fact that our bodies are not adapted for flight, and that they can never fly.

THE NEXT QUESTIONS BEGIN ON PAGE 2799.

46020

THE LIGHT THAT EXPLAINS THE STARS TO US



When pure light, as from a white-hot iron, passes through a glass prism, it is broken up into seven colors, called the spectrum, as shown in the first picture. But light from the sun shows, in addition to the colors, various lines, as seen in the second picture. These lines are caused by some of the different substances that compose the sun. Although here we see only a few lines, the sun's spectrum really shows over 2000 lines. The third picture is the spectrum of a star, Sirius, and when compared with that of the sun, it shows that the stars are made of the same materials as the sun and earth, because the lines in the spectrum for different substances always appear in the same position in relation to each other, as can be seen by comparing these spectra of the sun and Sirius. Although the spectrum color of the metal sodium is yellow, as in the fourth picture, this appears dark in the sun and star spectra, because of the intense light behind it, just as a gas-jet seen in front of the sun's disk appears black; but of course sodium is in the same position in all the spectra.



The Milky Way is the wonderful continuous band of stars that encircles the heavens. The picture on the left shows it in the northern heavens, and the picture on the right in the southern heavens.

THE COLOR OF THE STARS

CONTINUED FROM 2645



BY means of three instruments we are able to study the stars, and learn a great deal about them. These instruments are the eye, the telescope, and the camera. The telescope helps the eye by increasing its acuteness and by adding preciseness to what it observes; and the camera helps because it is sensitive to certain light of the stars which the eye could not see, even aided by the best telescope that exists. All that these instruments can do, however well they may be employed, and however perfectly developed, is simply to show certain points of light in the sky, so that, as we read on page 2644, we may compare their appearance as seen from different parts of the earth's orbit. There is as yet no hope at all of our being able to see the disk of a star—so far away is even the nearest star that it can be seen only as a point of light. We can, however, learn something more about these points of light by means of the instruments we have named, because we can watch their influence upon each other's movements in some cases, and so can learn something of their size or *mass*.

Now, all this is very necessary and very interesting. We may call it descriptive astronomy—the descriptive study of the stars. But we want to do more than any of these instruments will enable us to do by itself. We are not content merely to map out the heavens, make star catalogues, and calculate the distances of the stars when we can. In every science there is a farther stage. No matter whether you are studying fossils or stars or the weather, there is something more to aim at than mere description, however accurate and however interesting it may be in itself.

What we aim at always, in science, is explanation. Of course we cannot explain unless we correctly know the facts that we are trying to explain, and so description must always come first. Long ago, before men understood the nature of science, they used to try to explain before they went to Nature for the facts, and, of course, their explanations were always wrong and worse than useless. We know now that in every science correct description must come first, but we have to beware of another kind of mistake, which is that of fancying that we have explained a thing when we have correctly described it. The mind always has a tendency to stop and be content in science, until it learns that there is really no stopping-

place, and that even a true explanation requires explanation—that is to say, behind all causes there are further causes still. Now, let us apply this to the study of the stars.

We look at the heavens during the brief moments we call our lives; or, indeed, we may say that mankind looks at the heavens during the little space of the life of mankind; and we desire not merely to see, but to understand. It is not enough to know that such and such things are in such and such places; we want to know how they came into existence, unthinkable ages before the birth of mankind or the making of the earth, and what will become of them after we ourselves are dead, and after the earth itself, perhaps, has passed away. We want to know not merely what is there, but what is happening there. Now, let us very clearly understand that though the eye, the telescope, and the camera have done great things for astronomy, and will yet do more, it is not in their power to answer the questions which the mind is bound to ask.

THE WONDERFUL INSTRUMENTS THAT HELP TO EXTEND MAN'S KNOWLEDGE

Little more than half a century ago it seemed that there must be a limit to the advance of astronomy, No one could even begin to imagine any possible way of making further progress, except in improving what had already been done, making bigger telescopes and better cameras. But as for knowing what the stars were made of, or getting any idea of what was happening in them, there seemed to be no way in which such knowledge could ever be attained; and one of the greatest of thinkers of that time, who died something more than half a century ago, declared that man could never know the composition of the stars.

Then there came to the aid of astronomy a new instrument, the spectroscope which, like the others, is in itself an instrument of description. But the description is altogether of a new kind, and, unlike the other, it goes a good way towards providing us with the beginnings of real explanation. It tells us something of the history of the stars and of their destiny. As yet we have only begun the study of what has been called the "new astronomy," which directly depends upon the discovery and use of this instrument. I want particularly to insist on this point, because it has a lesson which is true of every kind of knowledge. All knowledge depends upon methods and instruments. Every method and every instrument has certain possibilities, but it also has certain limits. And it is not until a new method, or a new instrument, is employed that a new stage begins in the history of that branch of knowledge. Thus the invention of the telescope and of the microscope—which are in themselves only arrangements of pieces of glass—marked great epochs in the history of knowledge.

HOW THE SPECTROSCOPE SHOWS US THE REAL COLORS THAT ARE IN THE STARS

The same is true also of the spectroscope, which is only an arrangement of pieces of glass. Now, *scope* means see, *micro* means little, *tele* means at a distance, *stereo* means solid. What does *spectro* mean?

When white light passes through a piece of glass that is not flat on both sides, it is broken up into the various colors of which it is made. So a ray of sunlight passing through a prism is broken up into a band of color, which is called a spectrum. Now, a spectroscope is simply an instrument which shows the spectrum of any kind of light that passes into it. A little spectroscope can easily be carried in the waistcoat pocket, and you may hold it up to a flame or to the fire or to the electric light, or to any kind of colored liquid, and then you see at once a band of color, which is the spectrum of the particular kind of light you are looking at. This spectrum can be studied, piece by piece, or analysed, as we say, and so the study of spectra is called *spectrum analysis*.

THE NEW FIELD OF KNOWLEDGE OPENED UP BY THE SPECTROSCOPE

By this little instrument a whole new world of discovery is opened. No sooner do we put it to the eye, and turn it upon anything from which light proceeds, than we learn that everything which gives out light gives out light of a particular kind, or, as we say, has its own spectrum. Every chemical element, for instance, if made to give out light, is found to give out light which shows a different spectrum from that of any other element. So you can turn the spectroscope on to a gas-flame, for instance, and say at once, by looking at the band which is spread out before the eye, whether there is sodium

there, or carbon, or hydrogen, or potassium, or radium, as the case may be. Now if you can do this to a gas-flame, you can do it to the sun or to a star, and this means that the key to the composition of the stars is in our hands. If you take a pinch of salt and let some of it drop into the flame of a lamp or the gas, a brilliant yellow color will at once appear. It is so unmistakable that the eye alone can recognize it. But if you are looking at the flame through a spectroscope, you will instantly see the spectrum of sodium appear, and so you know for certain that there is glowing sodium in that flame.

HOW WE CAN TELL WHAT THE STARS ARE MADE OF FROM THEIR COLORS

Now, this is very interesting indeed, and it means that sodium can be detected by the spectroscope in exceedingly tiny quantities when the unassisted eye would tell us nothing. By exactly the same process, turning the telescope to the sun, or to a star or a comet, and applying the spectroscope, it is possible to say "There is sodium there." To-day a great part of all astronomical study is concerned with the spectrum analysis of the sun, the planets, and the stars, and the results are simply tremendous. Here, of course, we can only learn the principal things which they teach us.

First, we learn from spectrum analysis something which no one could well have expected. We readily understand how the telescope and the camera can teach us something of the movements of the stars; but, if we think we shall see that the only kind of movement which they can show for us is a movement *across* the sky. But suppose that a star be moving *through* the sky in our line of vision, whether from us or towards us, and no matter at what speed, then the telescope can tell us nothing.

THE MOVEMENT OF THE STARS THROUGH THE VASTNESS OF SPACE

No doubt in the course of long years it would record a difference in the brightness of the star, but we should have no way of knowing whether this was due to something happening in the star or to its movement. Now, the spectroscope has actually provided us with a means of discovering the movement, and even the rate of movement, of stars which are moving in our line of sight. The results thus obtained, added to our knowledge of star movements obtained by the telescope, are beginning to give us the outlines of what is happening in the world of stars, so far as movement is concerned. But first we must notice the beautiful way in which the spectroscope helps us here.

If we are standing at a railway station, and listen to the sound of a moving train, we notice that the engine's whistle rises in pitch if the train is approaching us, and falls if the train is going away. The pitch of the note depends on the number of waves that reach our ears every second. If the train is approaching us, it crowds these waves upon one another, so that more of them reach our ear in a given time, and the pitch of the note rises. If the train is going away, of course the intervals between the waves are dragged out a little, and so the pitch of the note falls. The discovery of this principle was first made as regards sound, but it is true of light also. Instead of the railway train and the engine's whistle sending out waves of sound, let us think of a star sending out waves of light. Now, if the star is moving in our line of vision, the waves will be crowded upon one another, or dragged out, according to whether the star is moving towards us, or from us.

DO THE STARS MOVE IN STRAIGHT LINES OR ALONG A CURVED PATH?

By spectrum analysis we are able to detect the changes in the light of the star, and we can thus accomplish the feat which it was declared could never be accomplished by man — that of discovering the motion of the stars in our line of vision.

Thus, by means of the telescope and the spectroscope, we are now beginning to learn a great deal about the movement of the stars which used to be called fixed, and everyone must wish to know whether any general truths can be discovered about the movements of the stars. For instance, is there a centre of the universe, perhaps occupied by a mighty star, around which all the other stars are revolving, like planets round a sun? This has often been supposed. We have no evidence of it, however, but we have evidence, rather, of something quite different. Then, again, we know in the case of the earth, and the other planets and the comets, that the motions of heavenly

bodies are in circular or elliptical paths, not onwards in straight lines for ever. It is natural to ask, therefore, whether the stars move in similar paths, or whether they dash on in straight lines. So far as the evidence goes at present, we cannot detect a curved path to any star; but it must be remembered that our knowledge of star motions is very young, and that if stars moved in curves, those curves would doubtless be very enormous, so that it might perhaps need centuries of observation to show that a star's path was really curved, and not a straight line.

Another question that has to be asked is about the motion of the Milky Way. This, we know, is a mighty belt of stars, somewhere in the middle of which our sun is placed. To the eye, of course, the belt looks equally distant at any part, and, though we cannot be quite sure yet, the Milky Way is probably not far from being a circle. We know something of the proper motions, as they are called, of many of the stars in the Milky Way; but what we should like to know is whether this mighty belt, as a whole, is spinning. No one can yet say.

ARE THERE TWO GREAT WORLDS OF STARS RUSHING THROUGH EACH OTHER?

For years past, however, a famous German astronomer has devoted himself to the study of the movements of the stars, and more lately he has been followed by an English astronomer working at Greenwich, and these students are beginning to show that, in all probability, the movements of the stars reveal to us something which was never suspected before.

In the first place, the movements of the stars are not entirely helter-skelter, even allowing for the movement of the sun and of our earth with him, which is, of course, sufficient in itself to give us the impression that the stars are drifting in a particular direction. Even fully allowing for this, it is plain that there are definite tendencies in the star movements, and we learn that these movements form, as a whole, two great drifts, which are moving in opposite directions to each other. One drift is moving considerably faster than the other, but both are moving. To one of these drifts, it seems, our sun belongs. It looks, then, as if there were two sets, or systems, of stars in the heavens.

This is a startling idea—that the stars which we see in the heavens really belong to two systems, which may even at one time have been far apart from each other in space, but which have met, and are now rushing through and past each other. How many more such systems there may be in infinite space, no one knows.

WHAT WE ARE LEARNING FROM THE STUDY OF THE CHEMISTRY OF THE STARS

Of course, it need hardly be said that astronomers all over the world are keenly studying this theory of Professor Kapteyn's, and what we now know of the movements of the stars will appear scarcely more than a few scattered trifles of knowledge in twenty or thirty years. But, at least, we are for ever past the old idea which was expressed in the phrase "fixed stars."

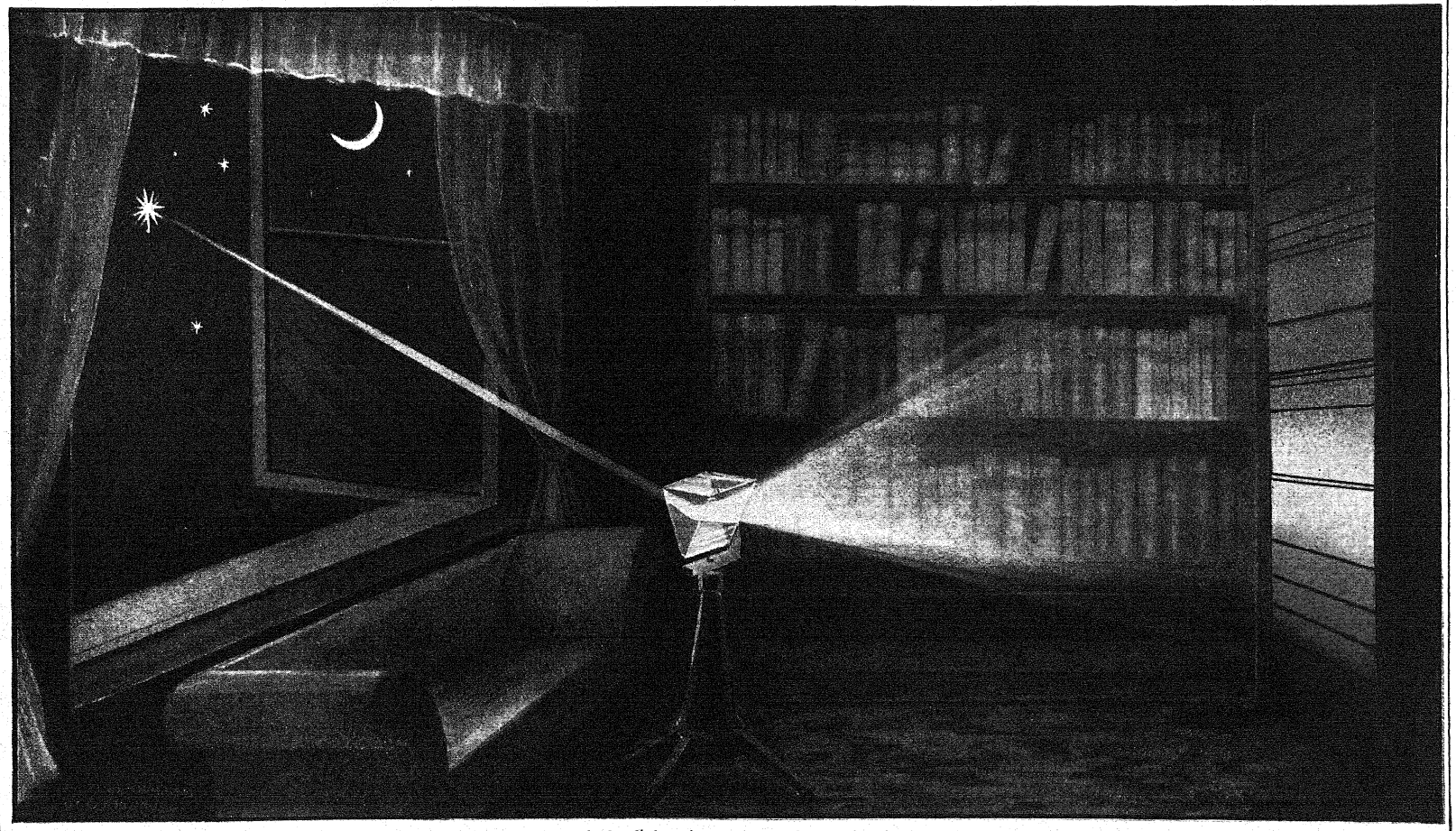
The contributions of the spectroscope to our knowledge of star motions have been very valuable, and no other means that we can imagine could have done for us what it has done. Yet they are quite the least part of what the spectroscope has taught us, for, as we have already hinted, it has created an entirely new field of knowledge—the chemistry of the stars. The study of star chemistry, like that of star motions, is still in its infancy, and in the main it is still a matter of description, but we are beginning to be able to explain also what we describe.

The first great result of the study of star chemistry is that everywhere throughout space, so far as we can see, the heavenly bodies are made of the same elements as those we find upon the surface of the earth.

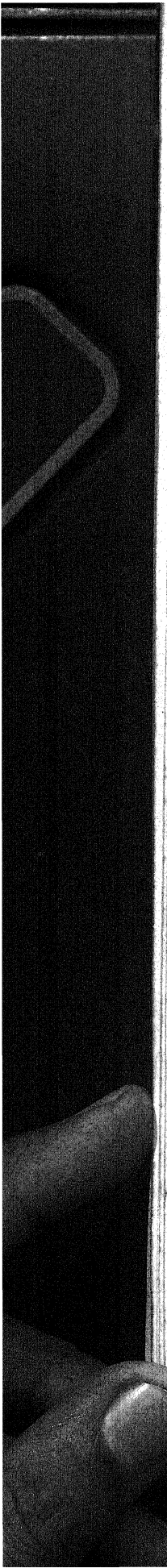
THE STARS ARE MADE OF THE SAME ELEMENTS AS THE EYE THAT SEES THEM

The features that we find in the spectrum of sodium or oxygen, when these are made to glow, we find in the spectrum of the sun and of many stars, and no one will question our right to conclude that the same effects are produced by the same causes, and that, therefore, sodium, oxygen, carbon, and so forth, are to be found in the stars. Not only so, but, with scarcely an exception, we find in the spectrum of the stars no features that we cannot refer to elements which we already know. The meaning of all this, not only for science in the narrow sense of the word, but for knowledge

HOW THE STAR-LIGHT TELLS US OF WHAT THE STARS ARE MADE



This picture shows us how the spectroscope is used to enable men to catch the light of a star, and by passing it through a glass prism to break up the light into various colors. As different metals give off different colors, we can in this way tell of what the stars are made. This picture does not show the whole spectroscope, but illustrates the principle.



itself, is stupendous. The very elements that make up the eye of the astronomer, or of the child who reads these words, can be practically seen glowing in the surface of a star so remote that perhaps it is thousands of years since the light by which we study it left the star. Throughout these enormous distances of space, in every direction we gaze, and in every variety of star, we find clear proof of the existence of the very same kinds of atoms as those we are breathing now, of which earth, air, and sea are made. Thus, if we never before had the right to use the word universe, we surely have it now, when the spectroscope teaches us that the very elements of which our own bodies are made are glowing in the farthest star, or were glowing when the light from that star left it.

No other revelation of the spectroscope could be more tremendous or have more meaning than this has; but by its aid we have already learnt much more. We do not find that the spectrum of one star is the same as that of another. On the contrary, we find that the stars can be classified according to their spectra, and this classification helps us to proceed from description to explanation, because it tells us something of star history.

THE THREE KINDS OF STARS THAT TEACH US SOMETHING OF STAR HISTORY

It seems that we may roughly divide the stars into three groups, according to their spectra, and no one will doubt that this way of classifying them is much more important than classifying them by brightness, as we usually do. In the first and hottest class, we find proof of the existence of large quantities of hydrogen and other gases. These have been called the *gaseous stars*. The second group is cooler, and these have been called the *metallic stars*, because they yield evidence of the existence of metals, such as calcium, magnesium, copper, iron, and many others. The third group of stars is cooler still, and these are sometimes called the *carbon stars*, because carbon is so conspicuous in them.

Now, we have already learned enough to teach us that these results mean something regarding the history of the stars. Long ago it would have been supposed that the different kinds of stars were made as they are, and have always been as they are, just as it was supposed that the elements, and the different kinds of living creatures on the earth, were made in the beginning as they are now. Nowadays, however, we have come to understand the great idea of evolution, which teaches us that things develop or evolve from one another.

CHANGES IN STARS THAT TAKE LONGER THAN THE LIFE OF MANKIND

It is much more than probable that the different kinds of stars which we can recognize illustrate for us different stages in the history of any star—stages which take such a tremendous time that no doubt the whole past life of mankind would not be sufficient time in which to notice any change in any one star. We believe that the hottest stars are the youngest, and that gradually, as a star cools, its chemical composition changes and the metals appear. Then carbon becomes the most conspicuous element.

Then, as we believe, the star cools still farther, until it loses its light. After that stage we can no longer study it by the spectroscope, for there is nothing for the spectroscope to examine. We can no longer see it at all; we can only learn something about it either because it eclipses a bright star, or because by gravitation it affects the movements of a bright star. It seems likely that the bright stage of a star is much the shortest, and that, after a brilliant youth, the star settles down to a long period of darkness.

Of course, we must ask where the hot, white hydrogen stars come from. If our account of stars is to be at all satisfactory, we should be able to trace out a way by which the dark, cold star may become a hot one again.

DO THE STARS DIE OUT AND BECOME STARS AGAIN?

It is not as if the skies gave evidence that things are running down and coming to an end. On the contrary, the skies contain stars in every stage of a star's history, and there is no more evidence, on the whole, of ending than there is of beginning. Somehow or other, dark stars must be capable of starting again, and the question is how. We shall find the key to the answer when we study the nebulæ. We may learn, perhaps, that though they are not stars now, they were stars once, and may be stars again.

THE NEXT PART OF THIS IS ON PAGE 2843.

THE FROLIC OF JOHNNY THE STOUT



"HO! for a frolic!"
Said Johnny the stout;
"There's coasting and sledding—
I'm going out!"

Scarcely had Johnny
Plunged in the snow,
When there came a complaint
Up from his toe.

"We're cold," said the toe,
"I and the rest;
There are ten of us freezing—
Standing abreast."

Then up spoke an ear:
"My! but it's labour—
Playing in winter. Eh,
Opposite neighbour?"

"Pooh!" said his nose,
Angry and red;
"Who wants to tingle?
Go home to bed!"

Eight little fingers,
Four to a thumb,
All cried together—
"Johnny, we're numb!"

But Johnny the stout
Wouldn't listen a minute;
Never a snow-bank
But Johnny was in it.

Tumbling and jumping,
Shouting with glee,
Wading the snow-drifts
Up to his knee.

Soon he forgot them,
Fingers and toes—
Never once heeded
The ear and the nose.

Ah, what a frolic!
All in a glow,
Johnny grew warmer
Out in the snow.

Often his breathing
Came with a joke:
"Blaze away, Johnny!
I'll do the smoke."

"And I'll do the fire,"
Said Johnny the bold;
"Fun is the fuel
For driving off cold."



THE BALLAD OF AGINCOURT

ON page 1874 we read that charming fairy poem "The Arming of Pigwiggen," by Michael Drayton, one of the famous Elizabethan poets. Here we have one of his spirited ballads, in which, with quick and graphic touch, he describes the battle of Agincourt, where the English army, led by King Henry V., won a great victory over the French after a closely contested battle, in which some 10,000 soldiers were killed. We read about the battle in the Book of Countries on page 774.

CONTINUED FROM 2664

FAIR stood the wind for France,
When we our sails advance,
Nor now to prove our chance
Longer will tarry;
But putting to the main,
At Caux, the mouth of Seine,
With all his martial train,
Landed King Harry.

And taking many a fort,
Furnished in warlike sort,
Marched tow'rds Agincourt
In happy hour;
Skirmishing day by day
With those that stopped his way
Where the French gen'ral lay
With all his power.

Which in his height of pride,
King Henry to deride,
His ransom to provide
To the king sending;
Which he neglects the while,
As from a nation vile,
Yet, with an angry smile,
Their fall portending.

And turning to his men,
Quoth our brave Henry then:
"Though they to one be ten,
Be not amazed;
Yet have we well begun,
Battles so bravely won
Have ever to the sun
By fame been raisèd.

"And for myself," quoth he,
"This my full rest shall be:
England ne'er mourn for me,
Nor more esteem me:
Victor I will remain,
Or on this earth lie slain;
Never shall she sustain
Loss to redeem me.

"Poitiers and Cressy tell,
When most their pride did swell,
Under our swords they fell:
No less our skill is
Than when our grandsire great,
Claiming the regal seat,
By many a warlike feat
Lopped the French lilies.'

The Duke of York so dread
The eager vaward led;
With the main Henry sped
Amongst his henchmen.
Excester had the rear,
A braver man not there:
O Lord, how hot they were
On the false Frenchmen!

They now to fight are gone;
Armour on armour shone;
Drum now to drum did groan,
To hear was wonder;
That with the cries they make
The very earth did shake;
Trumpet to trumpet spake,
Thunder to thunder.

Well it thine age became,
O noble Erpingham,
Which did the signal aim
To our hid forces!
When, from a meadow by,
Like a storm suddenly,
The English archery
Struck the French horses.



KING HENRY V

With Spanish yew so strong,
Arrows a cloth-yard long,
That like to serpents stung,
Piercing the weather;
None from his fellow starts,
But playing manly parts,
And like true English hearts,
Stuck close together.

When down their bows they threw,
And forth their bilbows drew,
And on the French they flew,
Not one was tardy:
Arms were from shoulders sent;
Scalps to the teeth were rent;
Down the French peasants went;
Our men were hardy.

This while our noble king,
His broadsword brandishing,
Down the French host did ding,
As to o'erwhelm it;
And many a deep wound rent
His arms with blood besprent,
And many a cruel dent,
Bruisèd his helmet.

Glo'ster, that duke so good,
Next of the royal blood,
For famous England stood,
With his brave brother
Clarence, in steel so bright,
Though but a maiden knight,
Yet in that furious fight
Scarce such another.

Warwick in blood did wade;
Oxford the foe invade,
And cruel slaughter made,
Still as they ran up.
Suffolk his axe did ply;
Beaumont and Willoughby
Bare them right doughtily,
Ferrers and Fanhope.

Upon Saint Crispin's day
Fought was this noble fray,
Which fame did not delay
To England to carry.
O, when shall Englishmen
With such acts fill a pen,
Or England breed again
Such a King Harry?

TO A NIGHTINGALE: A GREAT POEM BY JOHN KEATS

John Keats was one of the great English poets, and no matter how small a selection of the great poems in our language we had to choose, we could not avoid including one or two by Keats, as he wrote at least six which we must place among the finest poems ever written. That given here is one of his masterpieces. It contains a number of allusions to the mythology or fables of ancient Greece, for Keats was steeped in that ancient lore we call "classical," and as a poet he was really more inspired and quickened by the spirit of old Greece than by that of his own time.

MY heart aches and a drowsy numbness pains
My sense, as though of hemlock I had drunk,
Or emptied some dull opiate to the drains
One minute past, and Lethe-wards had sunk:
'Tis not through envy of thy happy lot,
But being too happy in thy happiness—
That thou, light-winged Dryad of the trees,
In some melodious plot
Of beechen green, and shadows numberless,
Singest of summer in full-throated ease.

O, for a draught of vintage! that hath been
Cool'd a long age in the deep-delved earth,
Tasting of Flora and the country green,
Dance, and Provençal song, and sunburnt mirth!
O, for a beaker full of the warm South,
Full of the true, the blushful Hippocrene,
With beaded bubbles winking at the brim
And purple-stainèd mouth;
That I might drink and leave the world unseen,
And with thee fade away into the forest dim:

Fade far away, dissolve, and quite forget
What thou among the leaves hast never known,
The weariness, the fever, and the fret
Here, where men sit and hear each other groan;
Where palsy shakes a few, sad, last grey hairs,
Where youth grows pale, and spectre-thin, and dies;
Where but to think is to be full of sorrow
And leaden-eyed despairs,
Where beauty cannot keep her lustrous eyes
Or new Love pine at them beyond tomorrow.

Away! Away! For I will fly to thee,
Not charioted by Bacchus and his pards,
But on the viewless wings of Poesy,
Though the dull brain perplexes and retards.
Already with thee! tender is the night,
And haply the Queen-Moon is on her throne,
Cluster'd around by all her starry Fays;
But here there is no light,
Save what from heaven is with the breezes blown
Through verdurous glooms and winding mossy ways.

I cannot see what flowers are at my feet,
Nor what soft incense hangs upon the boughs,
But in embalmèd darkness, guess each sweet
Wherewith the seasonable month endows
The grass, the thicket, and the fruit-tree wild;
White hawthorn and the pastoral eglantine;
Fast fading violets cover'd up in leaves;
And mid-May's eldest child,
The coming musk-rose, full of dewy wine,
The murmurous haunt of flies on summer eves.

Darkling I listen; and, for many a time
I have been half in love with easeful Death,
Call'd him soft names in many a musèd rhyme,
To take into the air my quiet breath;
Now more than ever seems it rich to die,
To cease upon the midnight with no pain,
While thou art pouring forth thy soul abroad
In such an ecstasy!
Still wouldst thou sing, and I have ears in vain—
To thy high requiem become a sod.

Thou wast not born for death, immortal Bird!
No hungry generations tread thee down;
The voice I hear this passing night was heard
In ancient days by emperor and clown:
Perhaps the self-same song that found a path
Through the sad heart of Ruth, when, sick for home,
She stood in tears amid the alien corn;
The same that oft-times hath
Charm'd magic casements, opening on the foam
Of perilous seas, in faery lands forlorn.

Forlorn! The very word is like a bell
To toll me back from thee to my sole self!
Adieu! the fancy cannot cheat so well
As she is fam'd to do, deceiving elf.
Adieu! adieu! thy plaintive anthem fades
Past the near meadows, over the still stream,
Up the hill-side; and now 'tis buried deep
In the next valley-glades:
Was it a vision, or a waking dream?
Fled is that music: Do I wake or sleep?

TRUE GREATNESS

The writer of this fine poem was Lady Elizabeth Carew, or Carey, who lived in the early years of the seventeenth century, and was the author of a tragedy entitled "Marian, the Fair Queen of Jewry," which was performed in London in the year 1613. She was a relative, on her mother's side, of the great poet Edmund Spenser, and died in the year 1635. The word "seld" in the last verse is, of course, the same as "seldom," but even a poet would now hesitate to use the word, though our language has not changed greatly since the time of Elizabeth, when "modern English" was established.

THE fairest action of our human life
Is scorning to revenge an injury:
For who forgives without a further strife
His adversary's heart to him doth tie:
And 'tis a firmer conquest truly said
To win the heart, than overthrow the head.

If we a worthy enemy do find,
To yield to worth, it must be nobly done:—
But if of baser metal be his mind,
In base revenge there is no honour won.
Who would a worthy courage overthrow?
And who would wrestle with a worthless foe?

We say our hearts are great, and cannot yield;
Because they cannot yield, it proves them poor:
Great hearts are task'd beyond their power but seld:
The weakest lion will the loudest roar.
Truth's school for certain does this same allow,
High-heartedness doth sometimes teach to bow.

* DOBBIN'S FRIEND

In these pleasing rhymes the late Mary Mapes Dodge, several of whose poems we have already read, describes with the charm of simplicity and natural feeling the familiar picture of a kitten as stable companion to a horse. Taken from "Rhymes and Jingles," by permission of Messrs. Scribner's Sons.

DOBBIN has a little friend,
Spotted white and sable;
Every day she goes to him,
In his lonely stable.

Not a mite of dread has she,
Not a thought of danger;
Lightly runs between his hoofs,
Jumps upon his manger;

Lays her soft, warm cheek to his,
Purrs her meek "Good-morning!"
Gives the flies that hover near,
Such a look of warning!

"Dobbin, dear," she sometimes says,
"Feel my winter mittens;
Nice and warm, you see, and made
Purposely for kittens.

"Dobbin, dear, such times at home!
Mother has caught a rat!
Brought it home to show to us—
What do you think of that?"

"Dobbin!" she whispers, purring still,
"You often get so weary,
Why don't you balk or run away,
And get your freedom, dearie?"

Then Dobbin gives his head a toss,
And says: "For shame, Miss Kitty,
If I could do so mean a thing,
'Twould be a monstrous pity;

"No, no; my master's good and kind;
I'll never vex him, never!"
And pussy, pleased, still rubs his cheek,
And likes him more than ever.

THINGS THAT NEVER DIE

Miss Sarah Doudney is an English writer well known for her many excellent stories for grown-ups as well as her books for girls. She has also written poetry, and these verses of hers are worthy of inclusion in our BOOK OF POETRY.

THE pure, the bright, the beautiful,
That stirred our hearts in youth,
The impulse to a wordless prayer,
The dreams of love and truth;
The longings after something lost,
The spirit's yearning cry,
The strivings after better hopes—
These things can never die.

The timid hand stretched forth to aid
A brother in his need,
The kindly word in grief's dark hour
That proves a friend indeed;
The plea for mercy gently breathed
When justice threatens high,
The sorrow of a contrite heart—
These things shall never die.

The memory of a clasping hand,
The pressure of a kiss,
And all the trifles, sweet and frail,
That make up love's first bliss;
If with a firm unchanging faith,
And holy trust on high,
Those hands have clasped, those lips have met—
These things shall never die.

The cruel and the bitter word
That wounded as it fell;
The chilling want of sympathy
We feel but never tell;
The hard repulse that grieves the heart
Whose hopes were bounding high
In an unfading record kept—
These things shall never die.

Let nothing pass, for every hand
Must find some work to do;
Lose not a chance to waken love—
Be firm, and just, and true:
So shall a light that cannot fade
Beam on thee from on high,
And angel voices say to thee—
"These things shall never die."

ONLY A BABY SMALL

The author of these familiar and pretty lines, the last four of which are very frequently quoted, was named Matthias Barr.

ONLY a baby small,
Dropped from the skies;
Only a laughing face,
Two sunny eyes.

Only two cherry lips,
One chubby nose;
Only two little hands,
Ten little toes.

Only a golden head,
Curly and soft;
Only a tongue that wags
Loudly and oft.

Only a little brain,
Empty of thought;
Only a little heart,
Troubled with naught.

Only a tender flower
Sent us to rear;
Only a life to love
While we are here.

Only a baby small
Never at rest;
Small, but how dear to us,
God knoweth best.

* From "Rhymes and Jingles," copyright, 1874, 1904, by Charles Scribner's Sons.

WHAT THE STARS HAVE SEEN

Oliver Wendell Holmes was an American physician; born at Cambridge, Massachusetts, August 29, 1809, and died at Boston, October 7, 1894. He achieved world-wide fame as a writer both of prose and verse, and during his long life wrote many books, which are all lighted up with the sun of humor and tender feeling. In these verses he pictures the stars above us as the everlasting silent watchers of what takes place in this world of ours. It is a quaint and humorous fancy, and, of course, is not to be regarded as serious poetry.

WHEN Eve had led her lord away,
And Cain had killed his brother,
The stars and flowers, the poets say,
Agreed with one another

To cheat the cunning tempter's art,
And teach the race its duty,
By keeping on its wicked heart
Their eyes of light and beauty.

A million sleepless lids, they say,
Will be at least a warning;
And so the flowers would watch by day,
The stars from eve to morning.

On hill and prairie, field and lawn,
Their dewy eyes upturning,
The flowers still watch from reddening dawn
Till Western skies are burning.

Alas! each hour of daylight tells
A tale of shame so crushing,
That some turn white as sea-bleached shells,
And some are always blushing.

But when the patient stars look down
On all their light discovers,
The traitor's smile, the murderer's frown,
The lips of lying lovers,

They try to shut their saddening eyes,
And in the vain endeavour
We see them twinkling in the skies,
And so they wink for ever.

THE DISCONTENTED APPLES

Mr. Frederic E. Weatherly is the author of this light and amusing little poem, which is not without a serious lesson that may be laid to heart by discontented young folk.

HE was an apple and she was an apple,
And they hung on an old brown tree;
And a fonder little couple
I trow you never would see.

But, alas! this little couple
They could not contented be;
"I should like to travel," she whispered,
"I wish that we could," said he.

But the summer went by so quickly,
And they still hung there on the tree:
For people can't always travel,
And apples are apples, you see. [grumbled
And they sighed, and they groaned, and
At the home that they once loved well;
Till there came a great wind through the orchard,
And down on the ground they fell.

"Oh, dear, what a bump!" she whispered,
"I'm bruised all over," said he;
But if people at home won't tarry,
They must get a few bumps, you see.

Then they found themselves put in a basket.
"We're off to the world," said she;
"I wish we were back in the orchard,
If this is the world," said he.

And this poor little couple
Were put in a dark big pie;
"Oh, love," sighed the wife to her husband,
"I think we are going to die."

And the oven grew hotter and hotter.
And they died, with a dream of home;
"Why didn't we stay in the orchard?
Oh, why did we want to roam?"

WILLIE'S LODGER *

It is often said that in each of us there are really two characters, a good and a bad one. Mary Mapes Dodge, the American writer, in this clever children's poem takes this idea for her subject, and the result is an excellent lesson in how to guard against the worse of our two characters getting the upper hand. The verses are reprinted from "Rhymes and Jingles," by permission of Messrs. Chas. Scribner's Sons.

TWO little boys named Willie
Live in the house with me.
One is as good a darling
As ever I wish to see;
His eyes are glad, his smile is sweet,
His voice is kind, his dress is neat,
And he is the boy for me.

This Willie says: "Good-morning!"
Happy as any bird;
A merrier laugh, a lighter step,
No mortal ever heard.
"Thank you," he says, and "If you please?"
He will not pout, he will not tease—
Oh, he is the boy for me!

The other Willie, sad to say,
Is very, very bad;
I think he is as cross a child
As ever a mother had.
"Go 'way!" he shrieks. He squalls and cries,
The angry tears oft fill his eyes—
He is not the boy for me.

He lingers round my Willie,
And whispers evil things—
Oh, how we dread him! for we know
The sin and grief he brings!
Who keeps him, then? Why, Willie's self;
He keeps this wicked Willie-elf
Who is not the boy for me.

If I were you, my Willie,
I'd make him stay away—
This boy who grieves your mother
And spoils your brightest day,
For he lives in you where he doesn't belong;
So oust him, Willie! Send him along!
"Clear out!" I'd say, "old Fume and Fret!
This heart of mine is not to let—
You're not the boy for me."

WHAT MIGHT HAVE BEEN

In these amusing verses, by Mr. Frederic E. Weatherly we have the reverse of the state of mind described by the same writer in "The Discontented Apples," on this page, and all will agree that the contentment of which he sings here is much better than the discontent of the apples.

THE little birds are singing
Above their speckled eggs,
The daddy-long-legs talks about
His children's lovely legs;
The red cow thinks her little calf
The best that there can be,
And my papa and my mamma
Are very proud of me!

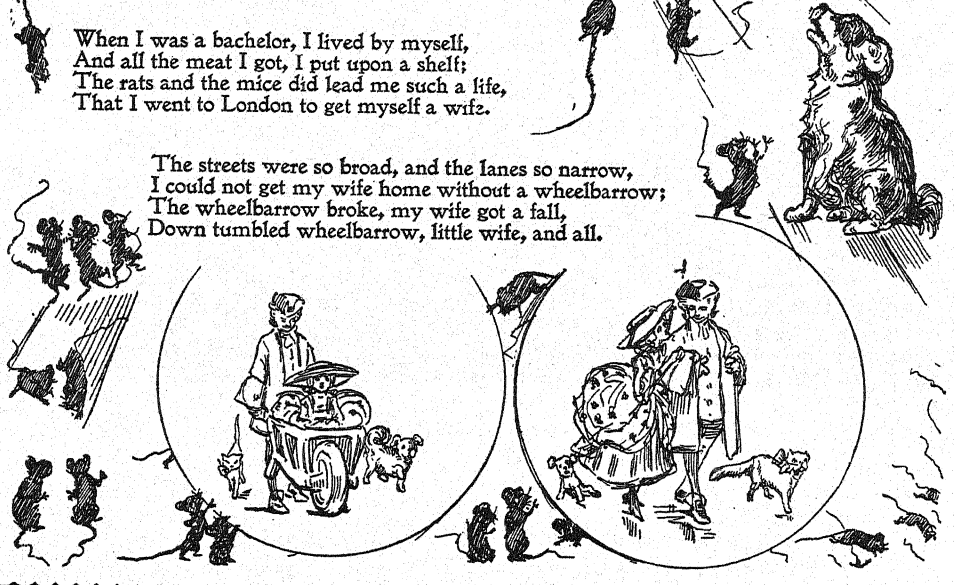
And yet I might have been a bird
And slept within a nest,
Or been a daddy-long-legs,
With scarcely any chest;
Or been a little calf or pig,
And grown to beef or ham;
I'm very, very, very glad
That I am what I am!

* From "Rhymes and Jingles," copyright, 1874, 1904, by Charles Scribner's Sons.



When I was a bachelor, I lived by myself,
And all the meat I got, I put upon a shelf;
The rats and the mice did lead me such a life,
That I went to London to get myself a wife.

The streets were so broad, and the lanes so narrow,
I could not get my wife home without a wheelbarrow;
The wheelbarrow broke, my wife got a fall,
Down tumbled wheelbarrow, little wife, and all.



SOME little mice sat in a barn to spin;
Pussy came by, and she popped her head in.
"Shall I come in and cut off your threads?"
"Oh, no, kind sir; you will snap off our heads!"
"Oh, no, I'll not; I'll help you spin."
"That may be so; but you won't come in."

GOOD-MORROW to you, Valentine!
Curl your locks as I do mine;
Two before and three behind;
Good-morrow to you, Valentine!

I HAVE seen you, little mouse,
Running all about the house,
Through the hole, your little eye
In the wainscot, peeping sly,
Hoping soon some crumbs to steal,
To make quite a hearty meal.
Look before you venture out,
See if pussy is about,
If she's gone, you'll quickly run
To the larder for some fun,
Round about the dishes creep,
Taking into each a peep,
To choose the daintiest that's there,
Spoiling things, you do not care.

LITTLE BINGO



THE girl in the lane, that couldn't speak plain,
Cried gobble, gobble, gobble;
The man on the hill, that couldn't stand still,
Went hobble, hobble, hobble.

THERE was a little boy went into a field,
And lay down on some hay;
An owl came out and flew about,
And the little boy ran away.

LITTLE Betty Winkle she had a little pig,
It was a little pig, not very big;
When he was alive he lived in clover,
But now he's dead, and that's all over.
Johnny Winkle he
Sat down and cried;
Betty Winkle she
Lay down and died;
So there was an end of one, two, and three,
Johnny Winkle he,
Betty Winkle she,
And Piggy Wiggie!



BEAUTY AND THE BEAST

CONTINUED FROM 2636

A RICH merchant had three daughters. The two elder ones were cross and ugly, but the youngest daughter was so sweet and lovely that she was called Beauty. But the day came when the merchant lost nearly all his money. He had to sell his grand house and go to live with his daughters in a little cottage. He was too poor to keep any servants, but Beauty willingly undertook all the work of the house, and even tried to find excuses for her lazy sisters when they stayed in bed till quite late in the morning and allowed her to wait on them all day long.

One day, while the merchant worked in his garden, a letter was handed to him. He opened it, and learned that if he could go to a distant town he would be able to obtain work. Overjoyed at his good fortune, the merchant embraced his daughters, and prepared to set out.

"What shall I bring you when I return?" he asked Beauty.

"I want a new dress," cried both the elder daughters before Beauty could answer.

"I will bring you the best that I can afford, my daughters," replied the merchant. "And you, Beauty, what would you have?"

Beauty knew that it pained her father to feel that he no longer had the means to buy costly presents for his children, so she said quietly: "A rose, father, just a beautiful rose, if you can find one," thinking that such a present would cost him nothing.

So the merchant set out, and, after traveling for a whole day, reached the town to which he was journeying, and received his orders. The following day he prepared to return, but he had not gone far when, to his dismay, he discovered that he had taken the wrong turning. He was in the midst of a huge forest, and knew it was very unlikely that he would meet anybody of whom he could inquire his way.

After searching in vain for the right path for many hours, a terrible storm arose, and the merchant, in despair, climbed up into a tree in the hope of finding a light to guide him to some house. Sure enough, he saw a light, and, regaining the ground quickly, he leapt upon his horse and was soon before the gates of a magnificent castle.

For a moment he waited, but as nobody appeared he dismounted and strode up the steps. The house was brilliantly lighted from top to bottom and on every side were signs of wealth and luxury.

The merchant passed through the great hall, blazing with lights, and found himself in a large room. In the centre stood a table loaded with good things, and the merchant, being very hungry, sat down and ate a good

meal. When he had finished, he began to feel very sleepy. Opening a door at the end of the room, the merchant found himself in a comfortable bedroom. He undressed and got into bed, and soon fell asleep.

In the morning, to his intense astonishment, he found a new suit of clothes in the place where he had left his old ones. He thought this strange, but he put them on and made his way to the dining-room, where he found breakfast awaiting him.

When he had finished an excellent meal, he rose and wandered out into the garden. The flowers were magnificent, and the sight of a lovely rose-tree reminded him of his youngest daughter's request. Stooping, he cut a lovely bud, and placed it in his coat. Just then he heard a noise, and, looking up, found himself face to face with the ugliest man he had ever seen, for though he had a man's body, the face was that of a beast.

The merchant shuddered.

"Ungrateful man!" roared the Beast. "Did I not feed you when you were hungry, and shelter you for the night? And yet you repay me by robbing me of my flowers. Ingratitude is a sin I cannot pardon; in an hour from this time you must die!"

"Forgive me, I pray you!" cried the merchant, falling on his knees. "I did but pick a rose for my daughter, and could I have found you sooner, I would have thanked you for all your kindness."

After some pleading, the Beast consented to forgive the poor man if he would promise to send in his place the first living thing he saw on returning to his home; and the merchant, hoping that this would be his dog, who always ran to welcome his master long before anyone else had heard his footsteps, gladly promised, and departed.

To his horror, his first sight as he drew near the house was Beauty.

"Oh, what a beautiful rose!" she exclaimed, kissing him.

"Alas!" replied the poor man sadly, "you little know how dear it has cost me." And drawing her to him, he led her inside and told her the whole story.

"What you will do when I am gone, my poor children," he concluded, "I do not know."

"But you are not going," declared Beauty bravely, "for I shall go instead." And in spite of everything that the merchant could say, Beauty insisted on having her own way.

And so the next day they both set out for the castle, where they found a splendid supper awaiting them. They sat down to eat, and had scarcely finished when the Beast appeared. He looked at Beauty, and Beauty lifted her eyes and saw him. She shuddered and moved closer to her father. "What a dreadful man!" she was thinking. "I do hope he will kill me quickly."

But the Beast did not want to kill one so gentle, and he told her father that if he would go home and leave her behind, no harm should befall her.

So the merchant rode sadly away, and Beauty was left alone in the huge castle. But the Beast scarcely went near her all day, and when night came he showed her a beautiful little room, which he told her was hers. Sure enough, on the door was written "Beauty's Room," and inside was everything she could wish for. That night Beauty dreamed that a fairy came to her and bade her be not afraid, for she was quite safe.

The next morning she rose early and wandered through the gardens, but not one single person did she see. When she felt hungry she went to the dining-room, where she met the Beast.

"Do you think me very ugly?" asked the Beast.

"Well—yes," replied Beauty.

He spoke so gently that she felt quite sorry for him.

The Beast sighed and left her. The next day she met him again.

"Will you marry me, Beauty?" said the Beast.

"Oh, no, no, no!" cried Beauty, for, much as she pitied him, she could not bear the thought of marrying him, and the Beast went away looking very unhappy.

Soon after this, Beauty looked into a magic glass, and saw that her father was very ill. The next time she met the Beast again she begged to be allowed to visit her home.

"If you go away, it will kill me," said the Beast; "but rather than see you unhappy, I would bear any pain. Go, but you must return in a week."

At parting, the Beast gave her a magic ring, which would take her home and bring her back again when she wished to return, and Beauty was sur-

BEAUTY SAVES THE LIFE OF THE BEAST



"Oh, you must not die!" cried Beauty. "I will marry you, dear Beast, for it is surely better to be kind and gentle than to have a handsome face." And as she spoke a wonderful change came over the Beast.

prized to find how sad the parting with the great, ugly creature made her.

Her father was so rejoiced to see his daughter alive and well that he quickly recovered, and Beauty was so happy to be at home again that she forgot all about her promise to the Beast. The week slipped by, and then another, until one night Beauty dreamed that the Beast was dead. She burst into tears and awoke. She dressed quickly, and with the aid of her ring was soon back again in her little room in the palace.

She ran out into the gardens, and there, in a swoon, by the fountain lay the Beast. Beauty threw some water upon his face, and presently he recovered. When he saw her, he smiled.

"I could not live without you," he said faintly, "and so I tried to starve myself to death."

"Oh, you must not die!" cried Beauty, wringing her hands. "I will marry you, dear Beast, indeed I will. It is surely better to be kind and gentle than to have a handsome face; and indeed I love you."

As she spoke a wonderful change came over the Beast, and even as she looked he was transformed into a handsome prince.

Beauty was so astonished that she could scarcely believe her eyes. Taking her hand, the young man explained that a wicked fairy had cast over him a spell, which could not be removed till some gentle girl should promise to marry him, ugly as he was.

Beauty's father was overjoyed to hear the good news, but the disagreeable sisters were as jealous as they could be, and said such unkind things to Beauty at the wedding that the Prince turned them into statues, and placed one at each side of the palace gates, where they stand, still and cold, to this day.

THE RIDDLE OF THE SPHINX

THERE was once a King of Thebes, in ancient Greece, of whom it was foretold that he would be killed by his own son. So, when a baby boy was born to him he had it carried far away to a wild forest, and left there to die. But it was all in vain. For Œdipus, as the child was called, was found in the forest by a herdsman, and taken to Corinth; and there he grew up, not knowing who was his real father. And one day he met the King of Thebes, and slew him as a foreign enemy.

Œdipus did not know what a great crime he had committed, and he was surprized to learn that the King of Thebes was dead, and that the crown was offered to any man who could manage to answer the riddle of the Sphinx.

The Sphinx was a strange monster that did great harm to the people. She had a woman's face, and the body and claws of a lioness, and she crouched on a hill near Thebes, waiting to kill all the men who should pass by, because none of them could answer her riddle. But Œdipus did not fear. He went boldly up to her, and said:

"What is your riddle?"

"This," said the Sphinx. "There is a wondrous creature, and its like is not found on earth, in air, or in water. At first it goes on four legs, then it goes on two, and at last it goes on three."

"Man!" cried Œdipus.

And so it was. In infancy man crawls on four legs, then he walks on two, and when he grows old he uses a stick as a sort of third leg. When her riddle was solved, the Sphinx cast herself from the hill, and died, and the grateful people of Thebes crowned Œdipus as their king.

But one day Œdipus discovered that he was really the son of the man he had killed. This made him very unhappy, and he gave up his throne and wandered blindly about the country dressed in beggarly rags. But he had a tender and loving daughter, and she went with him and helped him and comforted him.



NOUREDDIN AND THE WONDERFUL PERSIAN

WHEN the good Haroun Alraschid became Caliph of Bagdad, he made his cousin Zenebi, King of Balsora, and Zenebi then sought for a wife worthy to be his queen. He ordered his Minister to find for him a maiden perfect in charm and beauty, and excellent in wit and intelligence.

For a long time the Minister tried in vain to discover such a maiden, but one morning a merchant brought to his house a Persian slave-girl who was very lovely and possessed marvelous gifts. The Minister gave the maid a set of rooms in his house, and resolved to introduce her to the King. But in the course of the day Noureddin, the son of the Minister, saw her, and fell deeply in love with her. She returned his love, and when the Minister came to conduct her to the Royal palace, he found the two young people seated together, deep in talk with each other.

On seeing them thus he cried: "Oh, unhappy boy! you have ruined me. The King will find this out."



"Pardon us, pray, for falling asleep," said Noureddin, when the old man came and woke them up at evening.

But after struggling between his affection for his son and his duty to the King, the Minister gave way, and allowed Noureddin to marry the beautiful Persian. He then tried to keep the King quiet, by pointing out how hard it was to discover a maiden in whom great beauty and great wisdom were joined. But the King found out about the Persian maid, and sent his men to bring Noureddin and the maid to him.

Happily, a friend of Noureddin's heard the order, and hurried out and warned him, and Noureddin and the beautiful Persian at once fled from Balsora, and got on a ship sailing to Bagdad. But when they arrived at Bagdad they did not know where to stay, as they had never been in this famous city before, and after wandering about the crowded streets until they were weary, they entered a gate leading to a beautiful garden, and there sat down by a fountain, and fell asleep. At evening an old man came to the spot and woke them up.

"We pray you to pardon us for falling asleep here," said Noureddin. "We are strangers in Bagdad, and we walked about the city until we were quite tired out. This garden is really the most delightful spot that I have ever seen. Oh, what a happy man you are to possess it!"

Now, the garden was really one of the lovely pleasure-grounds of the great Caliph, and the old man was only one of the keepers. But he was so flattered at being taken for the owner of the place that he at once offered to show Noureddin and the lovely Persian slave all over the lordly pleasure-house that stood in the middle of the garden opposite the Royal palace. He led them up the wonderful golden staircase, and then into the great hall built of jasper, and adorned with the richest treasures of the kingdom. At the sight of all the splendor, Noureddin was filled with joy, and he gave the old man a handful of gold, saying:

"Do, please, allow me to provide a banquet this evening. Give this gold to one of your slaves, and get him to buy a supply of meats and fruits and wine."

The old man ran out into the streets and bought a rich repast, and returned with it to the pleasure-house, and Noureddin and the beautiful Persian lighted all the costly lamps by the eighty windows of the great hall, and then they sat down with the old man and his guests to feast.

Now, the Caliph of Bagdad had a good view of the pleasure-house from his palace, and he was much surprized to see lights shining in all the windows of the hall. Any other ruler would have sent some courtier to inquire into the matter, but Haroun Alraschid liked to see into things himself, so disguising himself as a beggar, he went into the garden, and crept up to the pleasure-house just as the beautiful Persian commenced to sing to the sound of a lute.

"What a sweet voice!" he said. "I must find a way to see this charming singer without making myself known."

As he was wondering what to do, he saw a man fishing in the river that ran through the garden, and asked:

"Have you caught any fish?"

"Two," replied the fisher; and the Caliph bought them, and entering the pleasure-house, he bowed low and said to Noureddin:

"I see you are holding a feast, and as I have just caught two fine fish, I have brought them in the hope that they will add to your pleasure."

"Very well," said Noureddin. "Go and fry them in the kitchen."

The Caliph did so, and soon returned with the fish, and served it to the merry-makers.

When Noureddin had eaten his portion, he gave Haroun Alraschid a handful of gold, and said:

"I have never tasted better fish. Pray accept this little gift as a small return."

The Caliph took the gold and thanked Noureddin, and said:

"Will you bestow an inestimable favor on me? Let me hear one song from the lips of the sweet singer at your side."

The beautiful Persian at once took up her lute and sang song after song, and the Caliph listened to her with exceeding delight. And in between the songs Noureddin related the story of their marriage and their flight.

Then Haroun told Noureddin who he was, and he sent a letter to King Zenebi commanding him to retire from the throne, and made Noureddin and the beautiful Persian, King and Queen of Balsora.

THE LUCK OF SIMPLE JACK

SIMPLE JACK was the best silk weaver in Spitalfields, but he had not the least idea of the value of money. If he went out with plenty of silver in his pocket, he was sure to spend it, either upon his friends, who used to crowd round him, or in buying very many things for himself and his wife that were of no use at all.

And not only did Simple Jack do this, but he would pay whatever the seller asked for any article; and, as the people all knew his weak points, Simple Jack was swindled whenever he went out to buy. He was just as silly if he wanted to sell, for then he would take whatever price was offered for his goods, no matter how absurdly low that price might be. So his wife used to do all the buying and selling that they needed.

But one day Simple Jack resolved to go a-marketing himself. He took a bundle of fine silks and sold them to a merchant for £40 ($200). Then, seeing a man with a donkey, he said:

"That donkey would be useful to me. Will you take forty pounds for it?"

Of course, the man readily sold it at this high price. But Simple Jack found that the donkey was very obstinate, and it would not go the way he wanted.

"How much will you give me for this stubborn beast?" he said to a costermonger.

"It would be dear at ten shillings," said the artful costermonger.

Simple Jack took the ten shillings, and with the money he bought a sack of new potatoes. But the sack was very heavy, and Jack soon grew tired of his new bargain. So he exchanged it at a fish shop for a mackerel. Naturally his wife was very angry when he told her how he had spent the forty pounds. But on cutting the fish open, she found in it a great pearl of remarkable beauty.

"Why, this must be worth thousands of pounds!" she cried.

"There you are, my dear!" said Simple Jack merrily. "I spend a beggarly forty pounds in buying a fish containing a rich jewel, and yet you say that I have no idea of the value of money."

THE CALIPH BROUGHT THE FISH TO THE FEAST



"I see you are holding a feast," said the Caliph to Noureddin, "and as I have just caught two fine fish, I thought I would bring them to you." "Very well," said Noureddin. "Go and fry them in the kitchen."

THE TREASURE OF THE POOR

THERE were once upon a time, according to a French story told by Jean Richepin, two very poor people who possessed nothing of anything. They had no bread to put in a bread-pan, and no bread-pan in which to put bread. They had no house in which to place a bread-pan, and no plot of ground on which to build a house. If they had possessed a plot of ground, they might have been able to find something wherewith to build a house. If they had possessed this house, they might have been able to place there a bread-pan. And if they had possessed this bread-pan, no doubt from time to time they would have been able to find a little bread to put in it.

But having neither field nor house, nor bread-pan nor bread, they were verily of the poor—very poor.

That which they most lacked was a little house of their own, where they could light a few dry sticks and sit over the blaze chatting together.

For the best thing in the world, better even than eating, is to possess four walls, without which a man is no more than a wandering animal.

These two poor people felt themselves poorer than ever one sad Christmas Eve.

As they were commiserating themselves on the great lonely high road in the black night, they stumbled upon a poor cat, who *mee-owed* to them.

This was truly a very poor cat, as poor as themselves, for it was nothing but skin and bone, and had scarcely any hairs on its skin.

If it had had some hairs on the skin, no doubt the skin would have been in a better state. If its skin had been in a better state, no doubt the cat would have been strong enough to catch mice, and would not have remained so dreadfully thin.

But not having any hairs, and with its poor skin on its bones, this was in truth a very poor cat.

The poor are kind to the poor, and help one another. These two poor people took the poor cat with them, and did not think of eating anything themselves, but gave to the cat a little lard which had been given to them in charity. The cat, having eaten, started off a little in front of the two poor people, and led them through the black night till they came to an old deserted hut.

There were two stools and a hearth in this hut, as they could see by a ray of moonlight, which shone and disappeared at the same time.

And the cat also disappeared with the moonlight.

So that they found themselves seated in darkness before a black hearth, which the absence of fire made still more black.

"Ah," said they, "if we only had a few embers! It is very cold! And what could be so pleasant as to sit warming ourselves over a bit of fire, telling stories?"

But there—there was no fire on the hearth because they were very poor people; in truth, of the poor, very poor.

All of a sudden there appeared two bright, glowing embers at the bottom of the chimney; two beautiful bits of fire—yellow, like gold.

And the old man clapped his hands joyously and said to his wife: "Do you feel how nice and hot it is?"

"I feel it," answered the old woman. And she spread her open palms over the fire. "Blow under them, and make them flare up," she said.

"No, no!" answered the man. "That would only burn them up quickly."

And so they began chatting to pass away the time, without sadness now, because they felt cheered up by the sight of two little yellow embers.

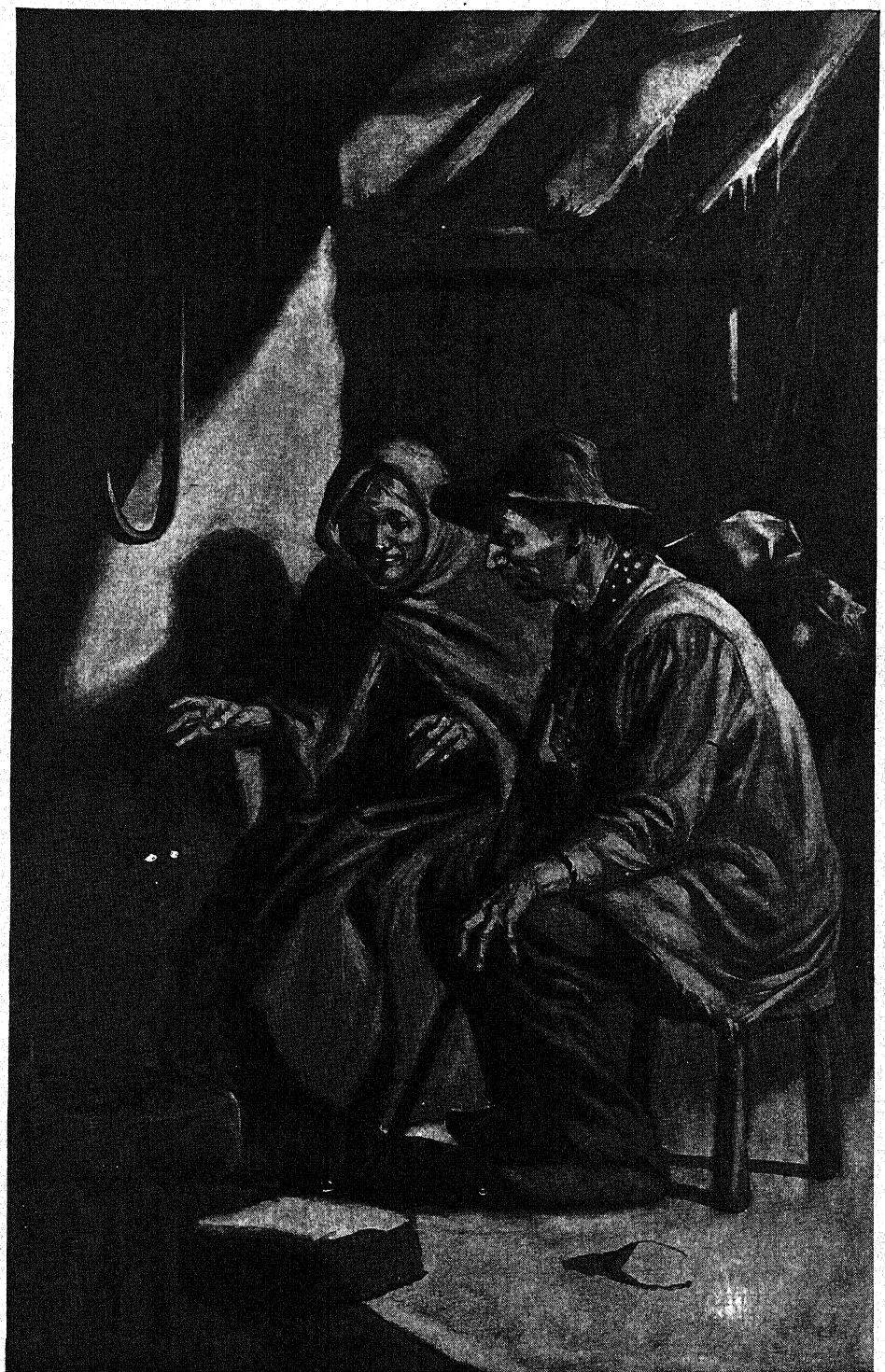
The poor are happy with very little, and these two rejoiced in seeing the beautiful present of fire which had come to them. Through the whole night they sat talking and warming themselves, quite certain now that the Child Christ wished them well; for these two shining embers remained mysteriously bright, and were never consumed.

And when morning came these two poor people, who had been quite warm and had been quite happy all night, saw at the bottom of the chimney the poor cat, who looked at them with its large yellow eyes.

And it was the reflection of its eyes which had kept these two poor people so warm and cheerful.

"The treasure of the poor is fancy," said the wise cat to them.

THE CAT LOOKED AT THEM WITH ITS YELLOW EYES



The two poor folk who had been kind to the cat, sat warming themselves all night by two glowing embers on the hearth, and only discovered in the morning that they were but the reflection of the cat's eyes.

LEGENDS OF PLACES AND THINGS

THE PIGEON AND THE MAGPIE

YOU must never keep saying "I know, I know," when anybody is telling you anything. For that was what the wood-pigeon kept saying to the magpie.

The wood-pigeon is a silly, careless bird. All he has for a nest is an untidy heap of twigs, raked together on a forked bough. There he sits and shivers in wintry weather, and you can then hear him singing in a very doleful way:

When all the world's in flower,
I'll build a bonny bower
For two.

But when the green leaves come out, and the fields are bright with blossom, he forgets how cold he felt in winter, and he sings joyfully:

Now all the world's in flower,
Who'd ever waste an hour
In building of a bower?
Who? Who?

One spring morning, however, the magpie took pity on him, and began to show him how to make a nice, warm, snug nest. But all the time the silly wood-pigeon, who did not know a thing about nest-making, kept on saying:

"I know, I know, I know!"

And at last the magpie got angry, and flew away, and said:

"Well, if you know so much, do it all yourself."

So the wood-pigeon still has only a few bits of twigs to make a nest for himself.

THE HERON, THE CAT, AND THE BRAMBLE BUSH

ONCE upon a time, and a very good time it was, though it was neither my time nor your time, nor anybody else's time, a heron, a cat, and a bramble bush found some fairy gold and bought a farm with it.

The heron took the hay as his share, and mowed it, and meant to carry it to market the next day. But in the night a storm came and blew the hay into the river, and it floated away. Ever since then the heron stands mournfully by the side of rivers and cries: "Pay me for my hay!"

The cat cut the oats and put them in a barn. But the storm drove all the rats and mice there for shelter, and they ate up all the oats. Ever since then the cat springs on every rat and mouse she sees, and cries: "Pay me for my oats!"

The bramble bush took the wheat, and harvested it, and carried it to market and sold it. Unhappily, the bramble bush sold on trust, and no one ever paid up. Ever since then the stupid bramble bush takes hold of everybody who passes by, and cries: "Pay me for my wheat! Pay me for my wheat!"

THE KING OF THE CATS

SOME years ago, two brothers lived in a lonely farm in a lonely part of Scotland, and the only creature they had to keep them company was a great black cat. One night the younger brother came home late, and said:

"I've just seen the strangest sight on earth. I lost my way on the hills, and came to a hollow tree with a light in it. I looked down the tree, and there was fairyland. A funeral was taking place, and a host of cats were following a little coffin stamped with a crown and a sceptre. Whatever can it mean?"

"I know," said the great black cat. "Old Peter is dead, and hurrah! I'm now the King of the Cats!"

And the cat rushed up the chimney and never was seen on earth again.

THE WHITE COW

MITCHELL'S FOLD is a circle of enchanted stones standing on a wild moor in West Shropshire. There, in days gone by, lived a white cow, and this white cow was the kindest and most wonderful creature that ever fed on grass.

She allowed anyone who came along to milk her, and, no matter how many persons came, she always had plenty of milk for all, so long as nobody took more than one pailful.

But one winter, when there was a grievous famine in the land, and everybody was living on the milk of the white cow, a spiteful old witch resolved to drive the gentle, fairy creature away, so that no one could get any milk.

Instead of bringing a pail, the old witch brought a sieve, and she milked, and milked, and milked, until she milked the white cow dry. The white cow at once vanished, and was never seen by mortal eye again, although some of the moorland people say that she changed herself into the tallest of the enchanted stones now standing in Mitchell's Fold.

HOW A SULTAN FOUND AN HONEST MAN

A SULTAN wanted to find an honest man to collect the taxes of his realm, but he did not know where to go for such a man, so he consulted a wise counselor, who advized him to publish abroad his need, and then to invite all the applicants to assemble at his palace on a certain night.

"I will show you the honest officer when you ask them to dance," said the wise man.

The applicants arrived in due course at the palace, where they were told by an officer of the Court that they were to advance to the Sultan, one at a time, through a dark and empty corridor. As soon as they were all assembled before the throne, the Sultan said amiably:

"Gentlemen, I should very much like to see you dance. Please dance."

But all the applicants refused, with many blushes, except one man, who danced cheerfully and well.

"That is the honest man," said the sage, pointing to the dancer.

In the dark corridor the wise man had placed sacks of money, and all the dishonest men had filled their pockets as they passed through to the Sultan. If they had danced, their pockets would have sounded like money-boxes being shaken, and so they had refused.

THE KNIGHT AND THE WONDERFUL STONE

A BRAVE English knight in the Holy Land was captured by the Saracens and thrown into a dungeon to die. But a nightingale came and perched on the window of the dungeon, and cheered the knight with her song; and the knight fed her with some of his scanty food, and made a pet of her. He used to talk to her as if she were a human being, and one day he said:

"Ah, sweet bird! If only you could help me to escape!"

The nightingale at once flew away, and as she did not return for three days the knight thought she had been killed by some hawk. But on the night of the third day she flew back to the dark dungeon once again, carrying in her beak a strange stone. The knight took the stone, and, by accident, touched his fetters with it, and to his astonishment and delight they fell off. He then went to the dungeon door, and touched that also with the magic stone, and the door opened.

The knight lost no time in leaving his prison, and he managed to escape to England, to which country the nightingale followed him. There the knight showed his gratitude to his little feathered friend by building her a golden cage, with an open door, in the garden of his castle.

THE KING WHO CAME TO CASHMERE

MANY years ago a Prince and a Princess in India fell in love; but their fathers were at war, and would not let them marry. So the lovers ran away together and hid in a great forest.

But in the evening, when the Prince was looking for food, a robber rode off with the Princess. He put her in a cave, and went to sleep; and the Princess then arose and bound him, and, dressing herself in his clothes, mounted his horse and went in search of the Prince.

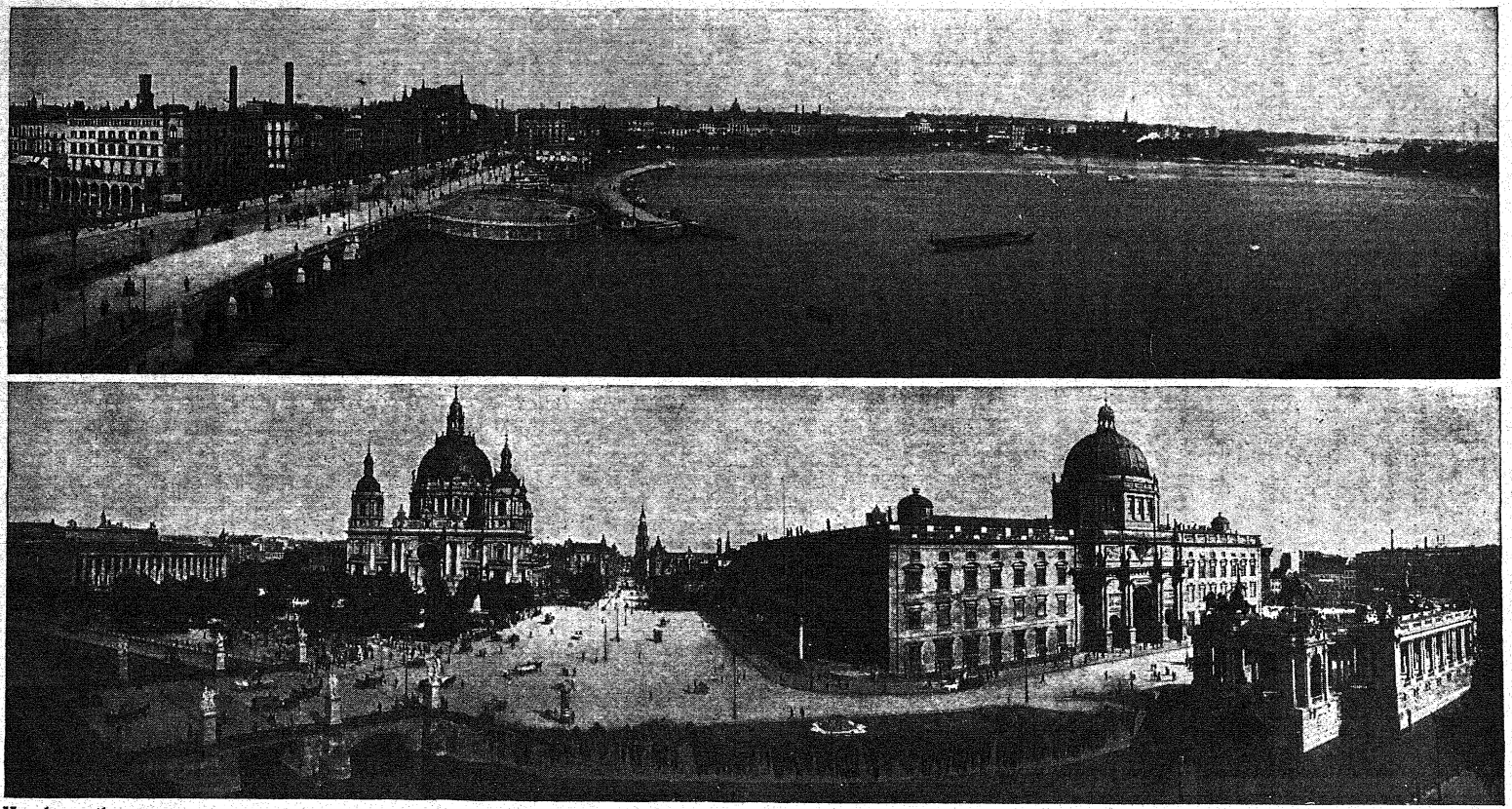
Instead of finding him, she came, in the morning, to the great city of Cashmere. All the streets were crowded with people who were anxiously watching an elephant. The king of the city and all his family were dead, and the people desired to find a new king to reign over them. Now, everybody in India believes that an elephant can tell who is of Royal blood, so the people had let an elephant loose, and they were waiting to see whom it would acknowledge as master.

To their surprize, it ran up to the disguised Princess, and knelt down before her. The people shouted for joy, and carried the Princess to the palace and crowned her king. She dressed up in kingly robes, and no one dreamed that she was not a man.

But when the Prince at last came to the city in search of her, she told the people that she was a Princess, and they made the Prince their king, and she married him and became queen.

THE NEXT STORIES BEGIN ON PAGE 2887

HAMBURG, THE HOME OF GERMAN COMMERCE, AND BERLIN, THE GERMAN CAPITAL



Hamburg, the greatest commercial centre and seaport in Germany, is shown in the upper picture. It is one of the principal commercial cities of the world, and was founded by the Emperor Charlemagne. It is built on the River Elbe, and from its mighty docks great liners go to all parts of the world. The lower picture shows Berlin, the great political centre of Germany and the capital of Prussia and the empire. It is not an ancient city, but is becoming one of the most imposing cities in Europe, with its many fine public buildings and monuments, and its splendid avenues and squares. The domed building on the left is the new cathedral, and the one on the right is the royal palace.



The Unter den Linden, the great triumphal road in Berlin, named after its avenue of lime-trees.

GERMANY AS IT IS TO-DAY

CONTINUED FROM 2600



THE story of England and France all through the centuries is written plainly for those who have eyes to see, in the streets and buildings of their capitals. With Germany it is somewhat different. For the early chapters of its story we must turn, not to Berlin, but to the famous old cities of the various states that now form the German Empire.

Berlin, which lies in the heart of Prussia, is the capital of Prussia and of the empire. Though the history of Berlin dates back to ancient times, it is a modern city, and there is little in it that is more than about 200 years old. This immense and magnificent city, which has grown up in so short a time, filling up the valley of the Spree with palaces and factories, illustrates in a wonderful way the rise of Prussia and the founding of the empire under its leadership.

It was the last elector—Frederick William, known as the Great Elector—who first made elaborate plans for the city, and who planted Unter den Linden, the double avenue of lime-trees which has developed into a triumphal way for his successors. Every ruler of Prussia since his day has beautified the capital by adding fine streets and squares, and bridges, splendid palaces and museums, picture galleries and public buildings of all kinds. Everywhere there are monuments and statues to keep in remembrance the men and the events that have helped to build up Prussia and the empire. In the last hundred years, the population has risen from 200,000 to over 2,000,000, and miles and miles of houses for rich and poor have been built. Berlin is noted for its cleanliness and lack of slum districts, and in the western district, where most of the wealthier people live, there are many handsome houses. Railway lines from all parts of the empire converge upon Berlin, and within the well-kept city itself are railways and conveyances of every kind. Just outside the Brandenburg Gate lies the Tiergarten, a beautiful, lake-dotted park, which stretches along the south bank of the River Spree. Berlin has other parks and many squares and open spaces, and only a few miles away a broad belt of forest land stretches round three sides of the city.

Although Berlin was founded in medieval times, few of its old buildings remain. It is almost as completely a modern city as any city in the New World. Consequently it is a comfortable place to live in; but it is not beautiful. It can boast of none of the

Copyright, 1918, by M. Perry Mills.

great architecture of the older cities of Europe, and though there are many statues in its fine, broad streets, and in its parks and gardens, they have little of the living charm of the work of the great sculptors of the Renaissance.

The most striking of the public monuments is the Column of Victory, which was erected to commemorate the victories of the last century which made Prussia the dominant power in Germany. The Column is 200 feet high—nearly as high as the Bunker Hill Monument at Boston, Massachusetts. The finest of the statues is perhaps the equestrian statue of Frederick the Great. The immense bronze statue of the king on horseback, is set on a pedestal, about the base of which are placed statues of his famous generals and groups of soldiers. Another fine statue is the monument to William I, the grandfather of Emperor William II, and the statue of Bismarck, although not so good, is worthy of praise.

From the statue of Frederick the Great, we can look across the Schlossbrücke, or palace bridge, to the imperial palace which is built on an island in the Spree. The palace bridge, which is the handsomest bridge in the city, is ornamented with groups of marble statues, and forms a fine entrance to the palace court.

From the Frederick statue we may walk down the Unter den Linden, one of the finest streets in Europe, to the Brandenburg Gate, the only one of the city gates that was left when the walls were torn down. This great gateway, which was copied from the beautiful gates of ancient Athens, is nearly sixty-five feet high, and is divided by stately rows of pillars into fine carriage roadways. Above it is a group of Victory in a four-horse chariot. This group was taken away, to Paris, by Napoleon I in 1807, but was brought back in 1814 after the War of Liberation.

BERLIN IS NOW THE CENTRE OF THE GERMAN EMPIRE

If you look at the map of Prussia you will see how far-seeing the old margraves were when they made Berlin the capital of Brandenburg. The city, as we know, is built on the Spree, whose waters are carried to the Elbe by the Havel. This, from its first beginning, gave the city water communication with the sea. The Great Elector built a canal to connect the city with the Oder. Since his time other canals have been built, and Berlin now has water communication with almost every part of the empire. It is also the centre of a great railway system. Twelve main railway lines meet at the city.

The city lies in the heart of the Prussian kingdom, and no effort has been spared to make it the centre of the empire, the place to which all Germans might turn as the source of their national life. It is not only the seat of government of the Prussian kingdom, but also of the German Empire, and it is here that the imperial legislature sits. Ambassadors from foreign countries live here, and before the Great War the University had become a Mecca for students from nearly all the other European nations and from America. Berlin is also the headquarters of the postal service, of the imperial army and of the navy. The fact that Berlin has been made the capital of the empire, while at the same time it is the capital of the Prussian kingdom, has added much to the influence of Prussia and increased her power, which was already great.

ALL GERMAN BOYS ARE LIABLE TO SERVE IN THE ARMY

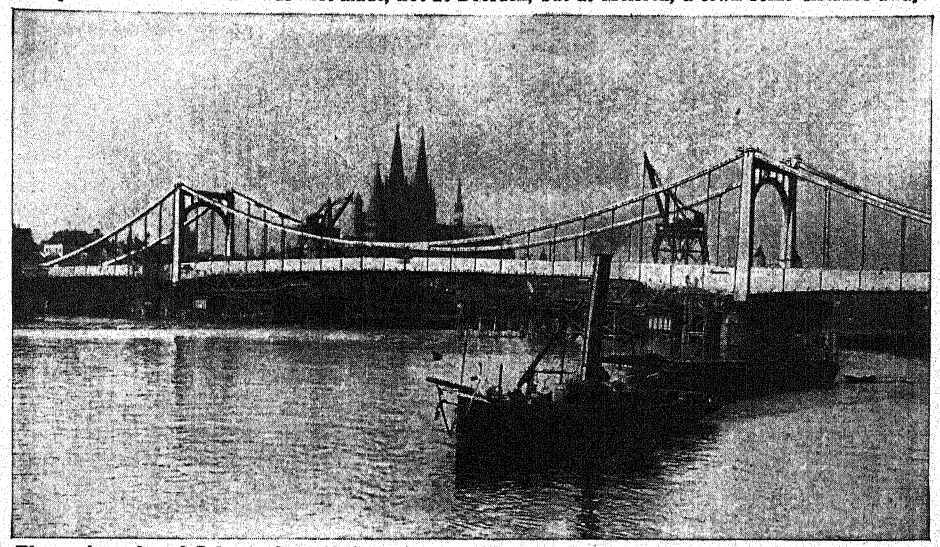
The German army of to-day has been built up on the Prussian army, to which, as we know, the Prussian rulers had devoted time and money without stint. Under the constitution, each state kept the administration of its own army, just as Canada and Australia have the administration of their armies. But, not long after the federation of the empire, the smaller states made treaties with Prussia, as a consequence of which, all the armies, except those of Saxony, Bavaria and Würtemburg, have been made part of the Prussian army, which, as you can easily see, forms much the larger part of the imperial army. The army of Bavaria is under the personal leadership of the Bavarian king.

The greater number of the men of the German nation are soldiers. Every German when he is twenty is liable to be called to the army to serve in the ranks—the infantry for two, and the cavalry for three years—unless some good reason prevents. The strength of the standing army in peace time was fixed in 1914 at a little over 661,000 of what we call enlisted men. This means that as service begins at the age of twenty, tens of thousands of men of that age are put into

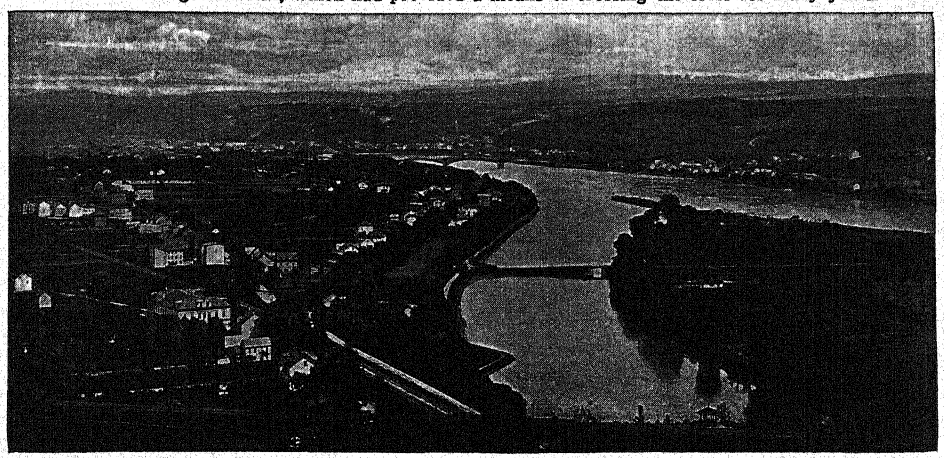
FINE OLD CITIES OF NEW GERMANY



Dresden is one of the most beautiful cities of Germany, and has been called "the German Florence." It is a great centre of education and music, and its museum is one of the finest modern buildings in Europe. "Dresden china" was first made, not at Dresden, but at Meissen, a town some distance away.



The ancient city of Cologne dates back to times before the Romans. Its fine cathedral, the towers of which show in the picture, was begun in 1248 and only completed in 1880. Cologne is joined to one of its suburbs across the Rhine by the bridge shown here, which was opened in 1916 and took the place of the famous Bridge of Boats, which had provided a means of crossing the river for many years.



Coblenz, one of the principal fortress towns of Germany, is built where the Rhine and the Moselle join, and it gets its name from that fact. The Romans called it Confluentes, which means "flowing together," and the German name has come from the name given by the Romans. The fine old palace of the archbishop is now used as a factory. There is an interesting bridge of boats at Coblenz.

training for active service every year, and you can imagine what an enormous army of trained men this provides at the end of seven years, when the young men leave the active reserve and fall back into the landwehr. In war time, all youths of seventeen are liable to be trained for active service. Each of the twenty-six states sends a stated proportion of its young men to join the army every year.

The German navy, of which the Prussian navy was the foundation, ranks second in size among the great navies of the world. As in the army, compulsory service is maintained. The young men of the coastal region are excused from service in the army, but in its stead are compelled to give their service to the navy.

The emperor is commander-in-chief of the army and navy and William II has given a great deal of his time to both. No detail is too small for his notice. From the planning of a great battleship, or the placing of a battery of huge guns, and the high explosives for their use, down to the bicycles that the men ride, the boots that they wear, and the cloth of which their uniforms are made, everything is brought to his personal attention.

The navy has always been his special care. The dearest wish of his heart has been that Germany should have command of the seas, and since his reign began, battleship after battleship has been built, and sailors have been trained to man them.

THE HARBORS WHERE THE GERMAN SHIPS ARE BUILT

At the same time a great merchant navy was built up. Great ship-building yards were constructed along the sandy shores of the Baltic and North Seas, at the mouths of the rivers where the water is deepest, at Stettin on the Oder, at Danzig on the Vistula, at Hamburg on the Elbe, at Bremen on the Weser. Monster battleships, liners among the fastest in the world, and submarines strong enough and large enough to cross the ocean have come from these great yards.

The headquarters of the navy are at Kiel, at the Baltic end of the canal which cuts across the province of Schleswig, to join the North Sea to the Baltic. Wilhelmshaven is also a large naval port, and so are Cuxhaven and Danzig. The North Sea entrance to the canal, Wilhelmshaven, Cuxhaven, and the Elbe are all protected by the great fortifications on the island of Heligoland. When this little island was ceded by the British to the Germans in 1884, it seemed to be fated to be devoured, bit by bit, by the sea, but since that time it has been built up into one of the strongest fortresses in the world.

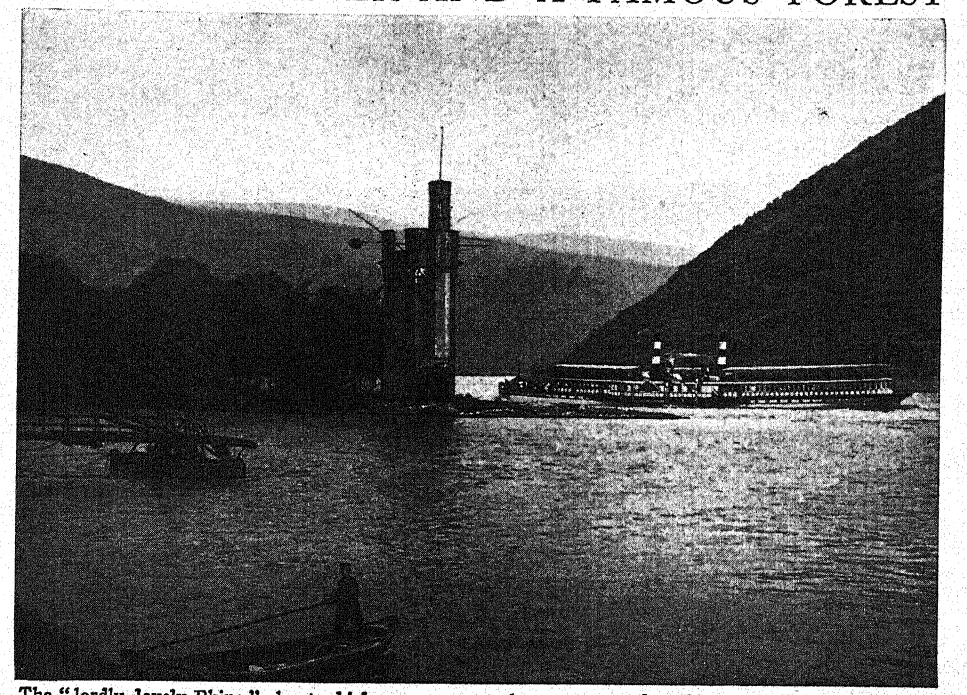
The two ports of Hamburg and Bremen both belonged to the old Hanseatic League and both have a republican form of government within the empire. They are the headquarters of the great ship companies, which have had so much to do with the extension of German commerce.

Hamburg is built on the Elbe and a steamer trip on the river will best reveal to us the wonders of the port, which is connected by railways with every part of Europe and is one of the most important places for trade in the world. We marvel at its great basins and acres of docks until we remember that they have been built to hold a large number of the ships required to carry into the country a great proportion of all that Germany needs, and take away much of what she has to sell.

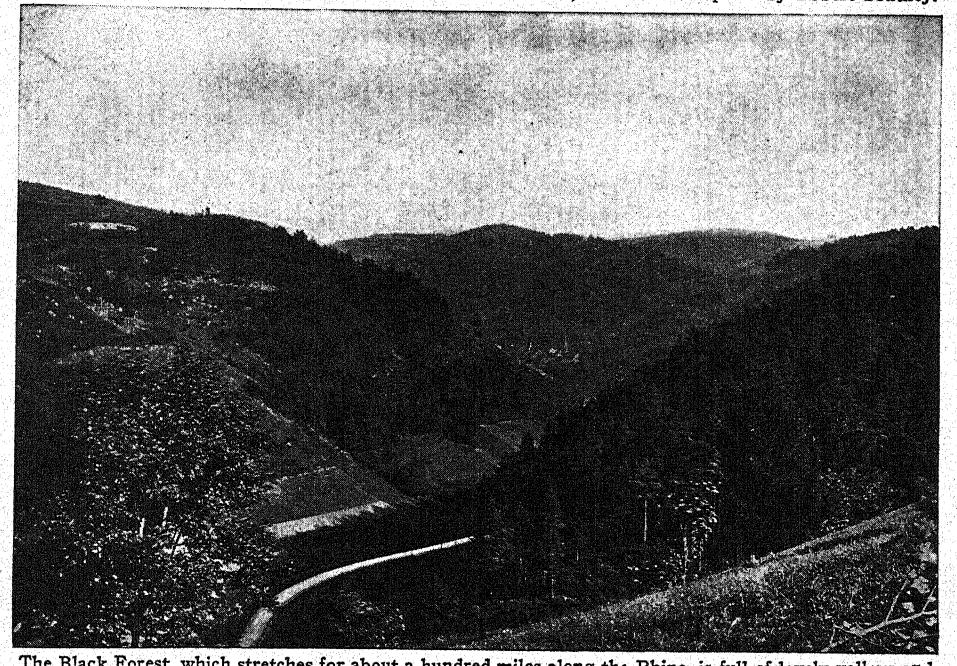
THE TOWNS AND CITIES ON GERMANY'S GREAT RIVERS

We know what she needs to some extent, from our own imports—tea, coffee, spices, and other things grown in hot climates—while in addition it is necessary that she should import quantities of raw material for manufactures. To find out what she has to sell and what she manufactures, let us now travel up the rivers and on the lines of railways that run in their valleys and connect all the important centres. The Elbe, with its long, navigable course—right into Bohemia—and its many tributaries, and its system of canals, plays an important part in the trade of the empire. The Spree, on which Berlin stands, reaches it through the Havel. On the banks of the Elbe are Dresden and Magdeburg. Dresden, the capital of the Saxon kingdom, has one of the greatest picture galleries in the world, and other great collections of art besides. But if we want to see the making of the famous Dresden porcelain, we must go to the ancient town of Meissen, a few miles down along the Elbe. Magdeburg is in the midst of great fields of beetroot,

A FAMOUS RIVER AND A FAMOUS FOREST



The "lordly, lovely Rhine," about which so many poets have sung so often, is one of the playgrounds of Europe. A favorite spot is Bingen, "fair Bingen on the Rhine," with its mouse tower, shown here. It is here that the wicked Bishop Hatto is said to have met his fate, as told in the poem by Robert Southey.



The Black Forest, which stretches for about a hundred miles along the Rhine, is full of lovely valleys and wooded heights. The forest has many busy mining centres, and, with its network of narrow valleys and its countless trees forming a barrier to the passage of an army, it is part of the great scheme of defence of the German Empire. This picture shows the lovely village of Nussbach nestling among the trees.

The photographs on these pages are by the Photochrome Co., Voigt, Frith, Beckett, E. N. A., and others.

from which enormous quantities of sugar are made. Magdeburg has also huge iron foundries and many other factories, and is a great centre of trade. The tomb of Otto the Great is in the ancient cathedral.

The River Oder runs a similar course to the Elbe, through fields of beet and potatoes or flax, and grain of different kinds. It also connects with Berlin by canal, so that the capital may be said to have two ports—Stettin, on the Oder, and Hamburg, on the Elbe. We have already seen how wonderfully Berlin has grown in its handsome west-end quarters. Its development in the matter of trade and factories is no less surprising. Thousands of workmen make in it machinery and locomotives, arms, chemicals, all sorts of woven goods, and every possible thing needed in furnishing a house.

Breslau, on the Oder, the second city in Prussia, is the capital of Silesia, which was taken by Frederick the Great from Maria Theresa. Like Berlin, it manufactures steam-engines and railway carriages, and linen and cotton goods.

These two great northern rivers come from the ring of mountains that have kept Bohemia so shut off through the centuries—the Giant Mountains and the Ore Mountains. Round about the lowest slopes of these mountains lie many coalfields, and mines of iron and zinc, and many other precious and useful metals. Hence the railway lines are thick here, as they are in our busy industrial districts at home.

THE MANUFACTURES THAT HAVE HELPED TO MAKE GERMANY PROSPEROUS

The wool of the sheep of Saxony and Silesia is used in the making of the famous flannels and warm materials now prized all over the world. Formerly Germany was an agricultural country. It grew enough grain and roots to feed its people, and raised great numbers of sheep, cattle, and horses. Now its chief wealth lies in its great manufacturing powers; and its energy and ability in this direction are the wonder of the world. We have just glanced at some of the industries in the valleys of the northern rivers. Leipzig, where the Supreme Court of the empire sits, is known to Americans for its great Conservatory of music. It is the great seat of the German book trade, and at Jena are made lenses, for microscopes and telescopes, which are famous all the world over. We shall find cotton and silk factories in the north-west of the country, where it is easy to obtain the raw material from abroad, and coal from the neighboring coal-fields. One of the largest of these is in the Ruhr Valley, near the Rhine, and upon it depend the enormous iron and steel works which supply most of the plates of iron and steel, the boilers and engines, and thousands of things needed to build up a great liner or warship, as well as cannon and arms of all kinds needed by the Army and Navy.

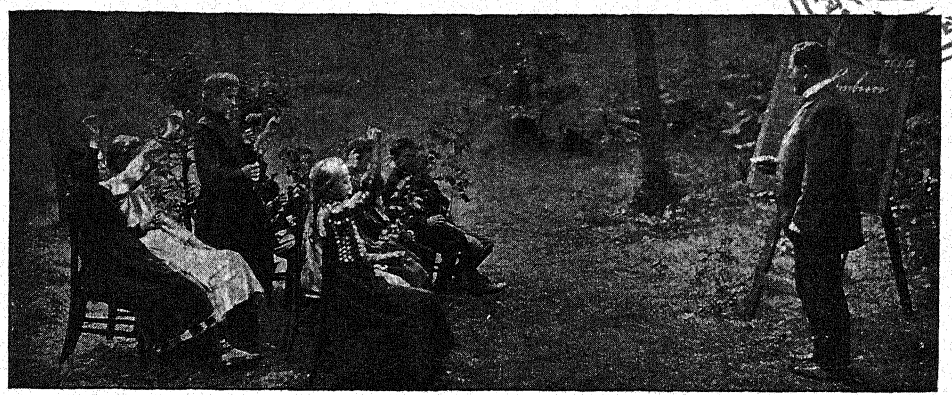
THE CATHEDRALS AND FACTORIES ON THE BANKS OF THE RHINE

In Krupp's great factory at Essen alone there are many thousands of people at work, and for miles round are growing towns, with tall, smoking chimneys, and the roaring blast furnaces and deafening clang of metal-working, reminding us of the Pittsburg region at home. Rohrort, the largest inland port in Europe is formed of three towns at the point where the Ruhr joins the Rhine, and here are docks and shipbuilding yards, besides business centres for grain and timber. Everywhere, too, in this district are factories in which furniture of every kind is made.

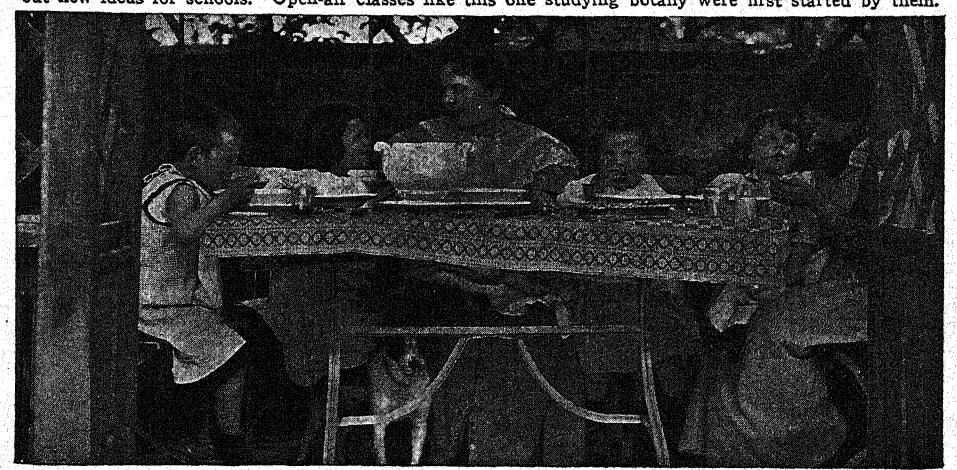
There are many passenger steamers on the Rhine; one runs from the mouth, in Holland, as far as Mainz, and provides an easy and pleasant way to see this wonderful part of Germany. After passing the flat part of the course, where the interest of the busy work going on makes up for the dulness of the scenery, we reach Köln—better known to us by its French name of Cologne—famed for its cathedral, one of the most magnificent Gothic buildings in the world. It was over six hundred years in building, and, when finished at last on the old plans, was opened in the presence of the Emperor William I. and the sovereigns of Germany.

Not far from Köln is Aachen, called by the French Aix-la-Chapelle, the home of Charlemagne, and now an important manufacturing centre. The famous cathedral, which was founded by Charlemagne, was for centuries the coronation place of the old German kings, and it was on a chair taken from his tomb that many of the kings were crowned. A bronze chandelier, given to the cathedral by Frederick Barbarossa, still hangs over

THE OPEN-AIR LIFE OF GERMAN CHILDREN



The Germans pay much attention to the health and education of children, and they are always thinking out new ideas for schools. Open-air classes like this one studying botany were first started by them.



All German children are taught that it is important to live as much as possible in the open air, and here we see a German mother with her children and their nurse taking their midday meal in the garden.



This is a familiar street scene in many German towns, and we can see how the children look as they go to, or come from, their schools. The tradesmen's carts are drawn about many of the cities by big dogs.

the place where the body of Charlemagne was laid.

THE TOWNS OF THE RHINE AND THE MOUNTAINS OF THE FAIRIES

The hills begin to rise each side of the broad river after leaving Cologne, and we pass numbers of towns and villages with promenades close to the river shaded by stumpy trees. The most important towns are Bonn, with its fine university and the romantic seven mountains close by, so full of legends and fairy stories; and Coblenz, beautifully situated where the Moselle joins the Rhine. On the terraced slopes of both rivers grow the vines from which much famous wine is made, and this trade makes Coblenz and other towns very busy.

On the Moselle is the oldest town in Germany, Trier, which the French call Trèves, with its beautiful Roman bridge and gate, and fine remains of theatre, baths, and temple. Here, too, is a most interesting brick building, called the Basilica, which was built perhaps in the Emperor Constantine's time, and was used for the administration of justice. It is now used as a Protestant church.

THE FIGURE OF GERMANIA KEEPING WATCH ON THE RHINE

From Coblenz to Mainz the scenery is very beautiful, with hills rising steeply from each side, many of them crowned with castles famous in the country's story in the Middle Ages; and everywhere grows the vine, and everywhere, too, are traces of the Romans and the French, who both occupied it in the past.

A few years after the Franco-German War, which gave Alsace-Lorraine to Germany as an Imperial territory, an immense national monument was set up on the hills opposite Bingen. It is the figure of Germania keeping watch on the Rhine. It is thirty-four feet high, and bears aloft the Imperial crown and the laurel-wreathed sword. On the huge base are portraits of the Emperor William I. and other German princes and generals, also representations of the troops from different states of the empire, together with the words of the famous national song, "Die Wacht am Rhein"—"The Watch on the Rhine."

SOME FAMOUS TOWNS, A FAMOUS SHOEMAKER'S SHOP, AND A FAMOUS FOREST

Mainz—in French, Mayence—the home of Gutenberg, has a fine position at the meeting of two rivers. It was founded by the Romans, and has a long and interesting history. It has a very famous cathedral, and its museum is also famed for its rich collection of Roman remains. Among other treasures is a Roman shoemaker's workshop, all complete with tools, leather and sandals. Shoes are still made at Mainz, and, like Coblenz, it is a great centre for the wine trade.

Frankfort-on-the-Main, one of the old free cities, and the place where for centuries the emperors were elected, is the centre of the great dye industry. As we have already learned, the most beautiful dyes, and many chemicals of great value in the arts and sciences, are made from coal-tar, which formerly was largely allowed to go to waste. In this work, Germany has long been the leader, her inventions have set the world an example in saving and making into a source of national wealth what was formerly looked upon as of no value.

Strassburg, the capital of Alsace-Lorraine, is two miles from the Rhine, but connected with it by canals and the River Ill. It is a sort of junction between Germany and the trading and manufacturing places just over the borders in France and Switzerland, and has always been a busy and important place. Its history has been an eventful one, which has left many traces in its fine cathedral and public and private buildings. The Vosges Mountains are the western boundary of this upper part of the Rhine, and in its valleys are many ironworks, and weaving and other industries. Mülhausen is the most important manufacturing town in the province, with its iron foundries and engineering works. It also employs many people making cotton goods, chemicals, and paper. It is on the canal joining the Rhine and the Rhône basins.

East of the Rhine, in Baden, lies the beautiful Black Forest. Here the peasants in their quaint little houses carve wood figures very cleverly, and also great numbers of cuckoo clocks. There are also many mines in the mountains, and industries of various kinds. Many visitors go to Baden to drink the mineral waters. The plain of Baden is very fertile.

In the early days, a large part of Germany was covered by forests, and many of the great legends of the people still hang round them. Though, of course,

a great part of these forests has disappeared, the country, especially in the mountain regions, is still well wooded. The governments of the various kingdoms that constitute the empire long ago recognized the value of the woods, and they are looked after and cultivated as carefully almost as garden lands. There are special schools of forestry, where the young foresters study trees scientifically, and as a consequence, the woods and forests are a steady source of income to the country. In the wooded sections, wherever a tree is cut down, a young tree is planted to take its place. Every part of the tree that is cut is used for lumber, or fuel, or pulpwood, or other useful purpose, and there is none of the waste that goes on in our forests and of which thinking people are ashamed. The forest regions comprize altogether about a fourth of the total area of the empire. Included in them there are several large forests, and of these of course the most famous is the Black Forest.

THE MIGHTY RIVER IN THE BLACK FOREST, AND THE TOWNS ON ITS BANKS

From the Black Forest rises the mighty Danube; the upper part of its course lies in Würtemberg, a hilly agricultural country about the same size as New Jersey. At Ulm the Danube passes into the large kingdom of Bavaria, and upon it, or its tributaries, are many great cities.

There is Munich, the capital of Bavaria, on the Isar, the third largest city in the empire, which attracts the art-loving world to see its treasures of pictures and its museum collections, and also to hear the concerts for which it is famous, or to attend its great university.

Augsburg possesses abundant water power, obtained from canals which cross the town. This has given rise to industries such as weaving and cotton-spinning, and making machinery and paper. In the past it was a centre of traffic from the north of Europe to Italy and the eastern part of theMediterranean; and its buildings remind us of the rich citizens of the Middle Ages, and the money-lenders who helped such great sovereigns as Maximilian I. and Charles V. Augsburg was a free city from the thirteenth century until the time of Napoleon, when it was added to Bavaria.

There is much that is interesting to be seen at Regensburg or Ratisbon, often called the key of the Danube, from its position; and fighting has often raged round it, from the times of the Romans right down to those of Napoleon Bonaparte. The diet of the Holy Roman Empire met in Regensburg for nearly one hundred and fifty years.

Ludwig I., King of Bavaria, built, in the last century, a German temple of fame a few miles out of Ratisbon. It is a copy, in grey marble, of the most beautiful of the Greek temples, the Parthenon at Athens. Over the north entrance is sculptured a representation of the battle won by Hermann over the Romans; on the south side, facing the Danube, is shown Germany regaining her liberty after the battle of Leipzig. Inside, running round the entire hall, is a frieze showing the history and life of the Germanic people before they became Christians. Over a hundred busts represent famous Germans who helped to make history. William I., the Victorious, was added in 1898. There are also tablets bearing the names of great men of whom no portrait exists, and some commemorate the work of those whose names, even, are unknown, such as the writer of the greatest early German poem and the architect of Cologne Cathedral.

THE TOWN THAT SENDS CHILDREN'S TOYS ALL OVER THE WORLD

Not far from Regensburg is Nüremberg, a free city of the empire till 1806, since when it has belonged to Bavaria. Long ago it was a centre of trade between Germany, Venice, and the East, and then the discovery of the sea route to India, round the Cape, took away much of its commerce and prosperity. It has very interesting old houses, like so many of these South German towns, and is full of reminders of the long wars, as well as of the wealth, importance and taste of a "City of the Empire." It is famous now for the great numbers of toys that pass from its workshops to delight children everywhere; also it makes machinery and metal wares, and lead pencils. We are now nearing again the Ore Mountains, whence we set out on our tour to the various large cities of Germany. In nearly all of these cities are to be seen fine old cathedrals, picturesque market-places and town halls, also universities, often dating back to the far past. And everywhere there are statues and war memorials, as in Berlin, linking the past with the present.

What numbers of different sorts of people we have passed on our road! Peasants in different states wear different costumes; and manners and customs and speech vary as much as they do in different parts of England and Scotland. Germany is only four and a half times the size of New York State, but there are now perhaps eighty millions of people living in it.

THE PEOPLE OF GERMANY AND THEIR RELIGION

More than half that number of people live in Prussia. Many work in the fields and vineyards and beautifully-kept forests, which cover a quarter of the country, in rain and shine. Others are to be found in the mines and factories, yards and shops, in the ports and ships, in the army, in the schools and universities.

We have heard the gay Rhinelanders singing the glories of the Fatherland and the beauties of the country, as the soldiers marched, as the schoolgirls played in the woods, as the students tramped up and down the hills. In other parts of the country the people are graver and slower, according to the branch of the German family to which they belong. Some of the differences that have arisen in the past have been on account of religion. North Germany is chiefly Protestant. South Germany is mainly Roman Catholic, and in the Rhineland are numbers professing both faiths. Slowly jealousies and dislikes are passing away under the influence of common aims and interests, and increased facilities for traveling about and mixing with one another, and for better education.

THE SPLENDID SCHOOLS TO WHICH THE GERMAN CHILDREN GO

Germany has always been in the forefront in matters of education, and to-day —except in the districts where so many poor Polish Jews live, on the borders of Russia—there are very few people unable to read and write. It was from Germany we learned how to make first lessons interesting to little children in kindergartens, and great pains are taken not only in elementary schools, but in higher grades, to make learning useful and attractive. The fees in the higher schools are so low that even poor people can send their children, and as there are many universities, and the expenses of living at them are small, almost any student can take advantage of the highest education to be had. Then great attention is paid to teaching the various trades under the best possible conditions, so that workers get a thorough training to fit them to earn their living. The Government has done its best to have the most useful subjects taught in schools, so that time should not be wasted, and to spread the knowledge of trades and industries, so as to encourage skilled workmen all over the empire.

The Germans were the first nation to pass a law to provide small pensions for old people who are no longer able to work, and who have not been able to save enough to live upon. The money for these pensions comes from an insurance fund. Premiums are paid just as in any other form of insurance. The worker has to pay half the small premium required, the employer has to pay half, and the state adds a certain yearly sum to every pension. No one who earns over $500 a year, however, is entitled to an old-age pension. There is also a law to provide funds for the care of workers in time of sickness. For sickness insurance the worker has to pay two-thirds of the premium and the employer one-third. The premiums for both the old age pension and sickness insurance are deducted from the amount due to a worker before he is paid. But the sums are small, and if a worker falls ill, his doctor's fees and hospital bills are paid. If his illness is serious, he may receive sick pay for about six months. In addition, employers are obliged to pay accident insurance for all their employees, and if a worker is injured in any way while he is at his work, the law decides the amount that he is to receive, so that his family shall not suffer while he is unable to work. If he dies, his wife receives a pension, and an allowance is made for each of his children, until the boy or girl has reached the age of fifteen.

Before the Kaiser came to the throne, Germany had been very slow in extending her borders beyond the seas and finding new markets for the goods she manufactured. At first travelers visited foreign parts, and traders from the old free cities followed them, setting up factories on the west and east coasts of Africa in places yet empty and un-

governed by the European nations who possessed other parts of the continent.

THE BEGINNING OF THE GERMAN COLONIES

At first, Prince Bismarck, who thought the German people had no genius for building colonies, opposed any attempt at securing foreign territory. He was won over, however, and in 1884 he directed that the German flag should be hoisted on the western coast of Africa, over settlements made there by a merchant of Bremen. This was the beginning of the German colonies; which, before twenty-five years had passed, included large sections of West and East Africa and of Togo and Kamerun in Western Africa. After the Philippine Islands and Guam, one of the Ladrone or Marianna Islands, had been ceded to the United States by Spain, Spain also sold the Caroline Islands and the rest of the Marianna Islands to the German Empire. About the same time, the beautiful Samoan Islands were divided between the United States and Germany. The empire also gained possession of the northern part of New Guinea, and later on, of two settlements on the Chinese coast.



DROPPING THE PILOT

This, the most famous of all Tenniel's "Punch" cartoons, shows Bismarck, the old pilot who had guided the German ship of state into the harbor of prosperity, passing from the direction of affairs, while the new captain, young Emperor William, who dismissed him, looks down from the deck.

Every means was taken to teach the German people about these distant places. Colonial exhibitions were held, where maps and photographs and samples were shown and information was given, in the hope that colonists would be encouraged to go out and settle. Bismarck was right, however. The Germans are a commercial rather than an adventurous people. In spite of the fact that the government built railways through its African territory, few Germans except the soldiers and officials went there to live. The people preferred to go to civilized countries, and large numbers came over to North and South America. They have formed large German-speaking settlements in Brazil, Argentine and Chili, where they have their own schools, and live very much in the same way that they did in their home country.

A few years after the consolidation of the German Empire Prince Bismarck brought about a great change in the life of the nation by introducing a high tariff on imported goods. Up to this time, the Germans had been largely agricultural people, but they now became a manufacturing people. Great factories were built, and the old cities began to teem with life. Within a short time immense quantities of manufactured goods were produced, and not only was the home market supplied but the manufacturers began to send their wares to other countries. As the wages paid to the workers have always been small, the manufacturers were able to make their goods at a smaller cost and sell them at a lower price than the merchants of other nations. As a consequence, the commerce of Germany grew by leaps and bounds. A magnificent merchant navy was built up, ships sailed from the northern ports, of which we have read, with their holds crammed with goods, for sale in every

corner of the world, and wealth flowed into the country.

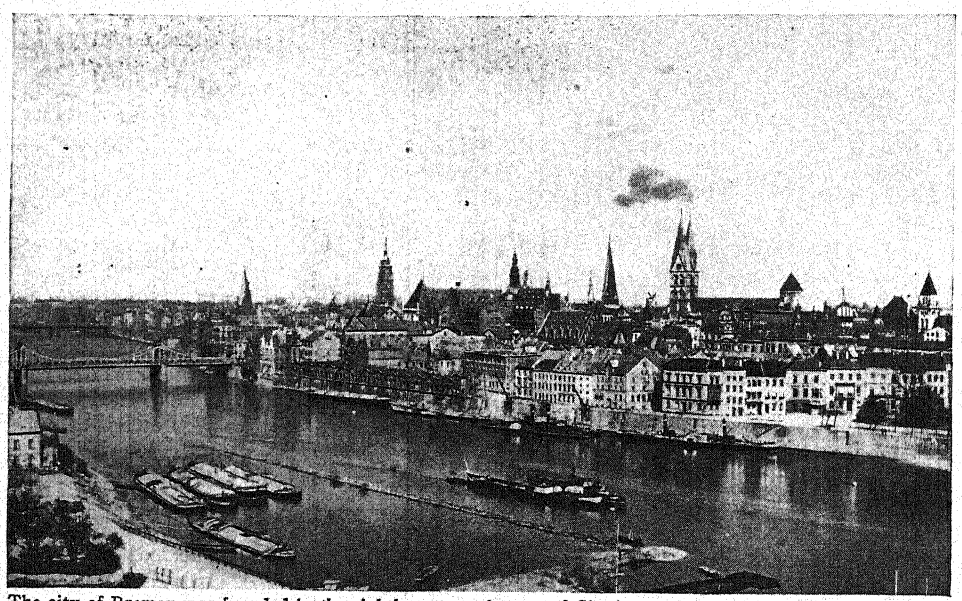
HOW THE YOUNG RULER DROPPED THE OLD PILOT

Prince Bismarck continued in office as chancellor throughout the reign of the Emperor William I, and the short reign of his son and successor, Frederick. But when William II ascended the throne it soon became evident that the old statesman's days in office were numbered. The new emperor, a strong-willed young man of active mind, wished to be ruler in truth as well as in name, and before two years had passed, he dropped the old pilot whose guiding hand had steered the ship of state during the difficult years after federation. Since Prince Bismarck's resignation, the emperor has been able to find chancellors, who have been obedient to his will and ready to carry out his instructions; but he has guided the state by the rules laid down by the master mind of Bismarck, the real founder of the empire.

The emperor's restless, energetic nature has led him to make full use of the power given to him, and he has taken almost as active a share in every branch of imperial affairs as he has in the army and navy. On the whole, this has helped to strengthen national feeling. The emperor's name has been constantly on the lips of the people, his doings have been constantly in the public eye, and gradually the mass of the people have learned to give him the greater part of the personal loyalty which had before been divided among the princes of the lesser states.

In 1914 the Great War began, and put an end to the prosperous life of the nation. The great merchant navy was scattered. The armies and navies of the allies took possession of the colonial territories of the empire, and no one can yet say what the ultimate fate of these islands and great tracts of forest and mountain land will be.

These German colonies included more than a million square miles, with a native population of more than 12,000,000. Though only a few white people lived in them, and the expenses were greater than the revenue, the German government had great hopes of future growth and development. When the war comes to an end the Germans will no doubt try to get their colonies back, but the people of South Africa, who have had so much to do with conquering them, will probably object very strongly.



The city of Bremen was founded in the eighth century, by one of Charlemagne's missionaries to the heathen Saxons. It became the centre of a diocese, which was afterward one of the numerous church states of the empire. The town belonged at times to the Hanseatic League, and after the Thirty Years War it was made a Free City. The ancient diocese now shows the curious picture of a republic within an empire. Bremen, with its port of Bremerhaven, has a large import trade and is the centre of one of the great shipbuilding industries of the world. This picture shows the older portion of the city, in which the ancient cathedral stands.

THE NEXT STORY OF COUNTRIES IS ON PAGE 2895.

THE STORIES OF CHARLES DICKENS

TWO more of the famous Dickens novels are told here in the form of short stories. "The Old Curiosity Shop" has not so strong a "story" interest as "Barnaby Rudge." In the first named we are deeply interested in the many strange characters to whom the author introduces us, but in "Barnaby Rudge," while the characters also interest us greatly, the story itself is one that can "hold children from play and old men from the chimney corner," so strong a grip does it take upon our mind. Of course, it is impossible in our limited space to bring in all the characters that figure in the original novels; but all who play a part in the story, that could not be left out, will be found in the following pages.

THE OLD CURIOSITY SHOP

CONTINUED FROM 2675

THE curiosity shop contained many quaint old things—rusty weapons, suits of mail, figures in china, tapestry, and pictures, but nothing in it looked older or more worn than its proprietor. He was a little old man, with long grey hair and bright blue eyes, and he lived here with only his granddaughter Nell Trent, a fair-haired, blue-eyed, sweet-tempered child. But though their years were so far apart, they loved one another dearly, being constant companions, and the old man's one desire was to build up a fortune for the child, that she might some day become a "fine lady." They had an errand boy, awkward and shock-headed, whose name was shortened by everyone from Christopher Nubbles to "Kit." And every night, when the old man used to go out on some mysterious errand, coming back in the early morning, he did not know that the faithful Kit had been watching over the house in which slept the lonely child, so that no harm should come to her.

Now, although Nell and her grandfather seemed to be all alone in the world, they had one relation, and that a very near one, no more distant, in fact, than Nell's brother Frederick. He was a selfish, spendthrift young man, always anxious to obtain money from the grandfather, and often reproaching him as a miser. If he had only known the cause of the old man's poverty! The secret of the nightly journeys was simply this: the old man tottered out to gamble with every penny he could get, in order to win more money for little Nell. Alas, to do this he had been obliged to borrow from Mr. Quilp, a misshapen dwarf, whose delight in life it was to make other people miserable.

When Quilp guessed how the old man spent his nights he boldly questioned him about the matter, and, instead of lending him the money for which he was asked, he had the goods in the shop sold off to redeem the debt already owing. Quilp falsely told him that Kit had been his informant, and thus the old man grew very angry with the clumsy boy, and spoke of him so harshly that Nell had to forbid Kit the house. Even when Kit asked her to make her home with his hard-working widowed mother, now that she and her grandfather had no money, the child dared not do so. Quilp's anger had been roused against Kit when the boy had said that he was "an uglier dwarf than could be seen anywhere for a penny," which, by the way, was undeniably true, but none the pleasanter for that.

There was nothing now for the grandfather and Nell to do but to leave the Old Curiosity Shop, and so they fled one night, wandering until they came into the country. Kit took home with him Nell's little caged linnet, and he soon obtained a good post as groom to a kind, rosy-cheeked, chubby old man named Garland. As the wanderers rested in a country churchyard they heard

the sound of voices near at hand, and when they went down a path they saw two men repairing a Punch and Judy show. They made friends with the men, stayed at the same inn overnight, and traveled with them the next day. But it was not long before Nell began to grow afraid of these men, who had got it into their heads that the old man and his granddaughter had run away from well-to-do friends, and that they were certain to gain a reward if they could restore them. So the child, who had now the cares of a grown woman on her shoulders, and the arranging of all the plans for the future for her aged companion as well as for herself, again planned their escape, this time while the men were exhibiting their show at a fair.

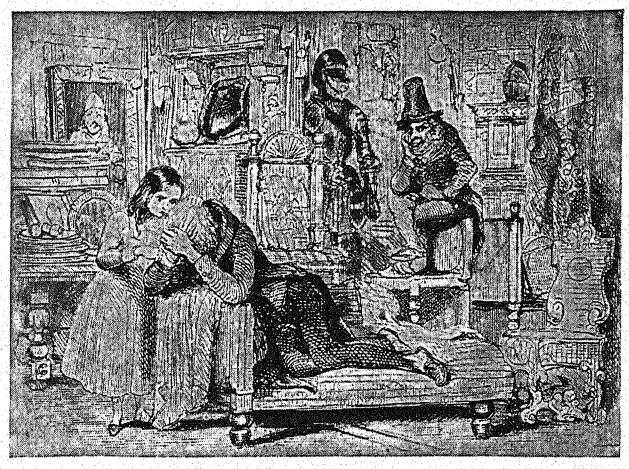
Nell encouraging the old man, they continued their wanderings. When quite exhausted they obtained shelter from a lonely schoolmaster, and, after leaving him, from a Mrs. Jarley, who traveled in a caravan with her waxwork show. Mrs. Jarley took a great fancy to the tender-hearted child, and employed her to show the wax figures to the country folk, while she also cared for the grandfather.

But the old man, who was no longer sane in his overmastering desire to win money to make Nell a "fine lady," took every penny he could from the poor child so that he might gamble with it; and at length Nell found that he was actually intending to steal money from Mrs. Jarley, with which to try his fortune again. The loving heart of his granddaughter could not endure the thought that he should stoop to dishonor, and she persuaded him to leave the hospitable Mrs. Jarley before he was guilty of robbing her.

Now, Quilp had a friend, just such a friend as one might expect the wicked dwarf to have—an attorney named Sampson Brass. Between the two, many people had come to grief, and many wrongs had been done to innocent persons. For reasons of his own, Quilp had obtained the post of clerk in Sampson Brass's office for Richard Swiveller, better known as "Dick," who was a friend of Frederick Trent. Dick was a warm-hearted, careless youth, always in debt, and when not quite sober he was apt to let out secrets. That he had a great many debts we may know from the fact that there were certain streets in



LITTLE NELL AND HER GRANDFATHER IN THE OLD CURIOSITY SHOP



LITTLE NELL COMFORTS HER GRANDFATHER

London down which he dared not walk for fear of his creditors, and he was afraid that he would soon be obliged to seek his fortunes elsewhere, as he made street after street a closed thoroughfare.

Mr. Brass had a lodger, a single gentleman of eccentric habits, who seemed to do little else than sleep both night and day, unless a Punch and Judy show came near. Then, indeed, he wakened up, made the showmen come to his room, talked earnestly with them, gave them something to drink, and sent them away again. The little maid-of-all-work was an ignorant, shy, nameless creature whom Miss Sally Brass ill-used and half starved. Dick, however, made friends with her, being sorry for her loneliness and being lonely himself. He taught her to play cribbage, bought—or, rather, incurred the debt of —food for her, and dubbed her "the Marchioness."

It often happens that those who are the poorest are most willing to share the little they have. Nell found it so now, for she received many kindnesses from the humble folk who took pity on her. Footsore and weary, she and her grandfather lay down to sleep near a river. They were roused by two men who were drawn in their boat by a horse, and were helped by them upon their journey. Tired and cold, an uncouth man led them to his furnace fires and made them rest there overnight. But once more someone was to be of use to them; this time their kindly old friend, the schoolmaster. He had received a better appointment in a distant town, and his surprize and joy were great when he met his two travelers on the way. Together they walked and talked until they reached his new home, and there he found for Nell the rest she so sorely needed. It happened that the old woman who formerly had the care of the church, opening and closing it at service times, and the showing of it to visitors, had recently died; the work was light, and suited for the delicate child. The schoolmaster obtained it for her, and she and her grandfather settled down in the place. Thus at last they found peace and contentment, beloved by all, and happy in their mutual love. They were to spend many peaceful days in the beautiful, smiling country.



MRS. JARLEY AND NELL IN THE WAXWORK SHOW

Meanwhile, Quilp decided to ruin Kit altogether, and he concocted a plan with his friend Sampson Brass. Both Sally Brass and her brother declared to Dick that of late they had missed several half-crowns and a silver pencil, but they knew of nobody who

could have taken them. One day Kit came to the office, and a five-pound note had been laid down carelessly as a trap for him. He had gone but a little way, on leaving the office, when he was ordered to come back, and, being certain of his innocence, the boy consented willingly to having his pockets searched. He became quite relieved when there was discovered in them nothing of any importance, but he was much amazed when the five-pound note was found in the lining of his hat. Of course, he was tried and sent to prison. Who could believe, after such evidence against him, that he was not guilty? Shortly after this Brass paid Dick his salary and dismissed him.

HOW "THE MARCHIONESS" REPAID DICK SWIVELLER'S KINDNESS

Dick Swiveller had a bedroom in a house close by Sampson Brass's office, and there, within twenty-four hours of his dismissal, this foolish young man was paying the penalty of his drinking habits, for he lay on his bed stricken with a raging fever.

In about three weeks' time he recovered consciousness, but he imagined himself still to be dreaming when he saw, close by, "the Marchioness" playing cribbage by herself. She explained to him that she had run away from Sally Brass, and had nursed him through his illness. Dick asked what had happened to Kit, and the small servant told him that also; but she knew more about it than most people, for she had listened at the keyhole of the office door, and had overheard a conversation between Sally and Sampson Brass, from which she gathered that Brass was to put the five-pound note in Kit's hat, have him sent to prison, and he would thus pay Quilp's grudge against the boy. Dick was, of course, too weak to rise from bed, but he wished to do so at once that he might proclaim abroad Kit's innocence.

KIT IS RELEASED AND SAMPSON BRASS IS PUT IN PRISON

Luckily, however, in one way, "the Marchioness" had been obliged to sell his clothes to get some money for him when he was ill. This did not prevent Dick from sending her at once for Mr. Garland. Kit's employer came in great haste, and showed much kindness to the invalid, and of course Kit was soon released; but though Sampson Brass was imprisoned, his sister managed to escape. It so happened that the lawyer who had aided Mr. Garland in the punishment of Sampson made inquiries about Dick, and found out that an aunt of his had died, leaving him with an income of $750 a year. In his gratitude towards her, Dick sent "the Marchioness" to school now that he had some means of his own; and when she left, now grown into a bright, clever young woman, she married the man whom she had nursed so tenderly.

Quilp was warned by Sally Brass that he would be arrested if he did not escape quickly. On a dark, murky night he tried to make his way along the wharf as the officers came to arrest him, but he staggered and fell, and next moment was fighting with the cold, dark water. His body was found some days later, and it was buried with a stake through the heart at a lonely cross-roads, that being the old way of burying people who had committed suicide, though Quilp's death was an accident.

WHO THE MYSTERIOUS "SINGLE GENTLEMAN" WAS, AND WHAT HE DID

The lodger at Sampson Brass's had now gained a clue to a certain mystery, thanks to his inquiries of the Punch and Judy men, and he at once went forth on a search for Nell and her grandfather. He told Mr. Garland that he and the grandfather were brothers. When they were both young he was very delicate, the grandfather being the elder and stronger of the two. Both fell in love with the same beautiful girl, but the younger one remembered how kind his brother had always been to him, and he left his home to travel abroad, so that he should not stand in his brother's way. The two young people had married, and one daughter was born to them before the mother died. This child, when grown up, had married a handsome young man, who had treated her badly. Both she and her husband died young, and left the old man with two grandchildren to look after—Nell and Frederick Trent. The girl had become sweet and beautiful like the mother, the boy a worthless fellow like his father.

Kit and Mr. Garland went with the single gentleman—who was really Master Humphrey, the teller of the whole story—to find little Nell and her grandfather in the village where their life was now

being passed so peacefully. When at length they got to the house, Kit was the first to enter the room in which the old man sat looking into the fire—but he sat alone. In an inner room Nell lay sleeping, he told them, and after a long time they followed him to her room. Her sleep was indeed a long one, for she was dead. "Dear, gentle, patient, noble Nell was dead. Her little bird—a poor, slight thing the pressure of a finger would have crushed—was stirring nimbly in its cage, and the strong heart of its child-mistress was mute and motionless for ever." Not long afterwards the old man followed her to the grave, and so ends the story that began in the Old Curiosity Shop.

THE COMPANY IN THE MAYPOLE INN ONE STORMY NIGHT OF MARCH, 1775



THE STORY OF BARNABY RUDGE

IN the comfortable Maypole Inn, on the border of Epping Forest, there was assembled round the fire one stormy night of March, in the year 1775, an oddly-assorted group of men, drinking and smoking. Of the company only one was a stranger. He was a weather-beaten fellow with a rough, grizzly beard, and an ugly wound on his face. After a while this stranger asked the company about a house which was within a mile of the Maypole, and thereupon old Solomon Daisy, the parish clerk and bellringer, told the story of the Warren, as the house was named, and here it is.

Twenty-two years before it had been the property of a Mr. Reuben Haredale, a very rich man. His wife died and left him with a daughter scarcely a year old, and, feeling lonely, he went to London for several months. On his return he brought back with him two women-servants, a steward of the name of Rudge, and a gardener. The bellringer of Chigwell, a village near by, had been alarmed that very night by the sound of a bell, just as he was about to toll the church bell for an old man who had died that day. In the morning it was found that Mr. Reuben Haredale had been murdered in his bed, and in his hand he held part of a rope connected with an alarm bell which rang on the roof of the Warren. His gardener had disappeared, and months afterwards the supposed body of the steward, Rudge, was found in a pool in the grounds, scarcely recogniz-

able save for his clothes, ring, and watch. A large sum of money had been taken, and people naturally believed that the gardener had committed the double



SIR JOHN CHESTER AT HIS EASE

murder in order to steal his employer's money. The Warren was now tenanted by Mr. Geoffrey Haredale, brother of the deceased man, who watched with jealous care over his niece, Emma Haredale, the child who had been born there, now a beautiful young woman.

When the sullen and mysterious stranger had heard this story, he immediately set out for London on horseback, giving Joe Willet, the son of the Maypole landlord, a savage cut with his whip as he rode away. When well on his journey he picked a quarrel with a traveling locksmith, named Gabriel Varden, with whose vehicle his horse had collided in the dark. Gabriel, after this encounter, went on to the Maypole, where he was well known, and had some gossip there about the strange man before he resumed his journey to London. He could see the city becoming visible as dawn approached, when he was startled by a cry for help hard by. On the ground there lay young Edward Chester, Miss Haredale's lover, and round him circled a crazy boy, none other than Barnaby Rudge, the son of the dead steward of the Warren. Gabriel and he conveyed the young man to Mrs. Rudge's little house, and with careful nursing he was soon restored to life and health. When Gabriel went back the next day to inquire for Mr. Chester, he was talking to the widow just as someone knocked at the window. Mrs. Rudge went to the door, and in a moment Gabriel heard her call out in horror and surprize. The locksmith rushed to her aid, and was surprized to see the stranger he had met the preceding night. He would have caught him, but the widow clung to him until the man escaped. She explained that this man held other lives than his own in his power, and between them there existed a secret which she dared not breathe. Later on Mrs. Rudge went to Mr. Haredale, telling him she must leave her house to become a wanderer, and refusing to touch again any of the money he allowed her every year.

Now, Edward Chester's father, Sir John Chester, was the bitter enemy of Geoffrey Haredale, having even hinted that Mr. Haredale was his own brother's murderer, and in a strange interview which they had at the Maypole one night each agreed that he would do his best to keep the lovers apart; Sir John was to restrain his son, and Mr. Haredale to reason with his niece. Sir John next told Emma that his son was not true to her, which she refused to believe, and afterwards he told Edward that he was to give up Emma, as he must marry an heiress, because they were already greatly in debt. The young man hotly resented this, and his hypocritical father at once disowned him, and Edward went to the West Indies to seek his fortune. At the time that the father cast off his son, Joe Willet did the opposite, and left



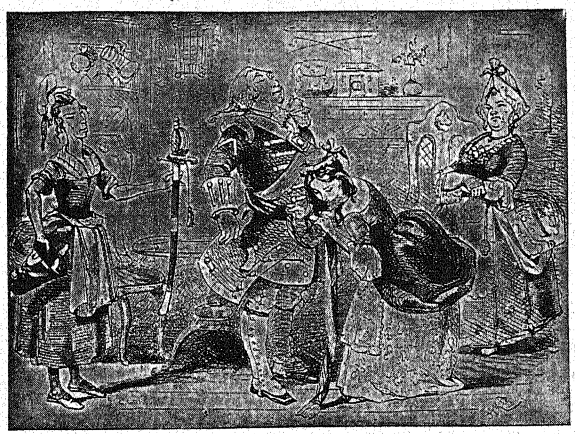
DOLLY VARDEN TAKES EDWARD'S LETTER TO EMMA

his father. He could no longer endure being treated as a boy, and after bidding farewell to Dolly Varden, the locksmith's charming daughter, he enlisted

in a regiment about to go abroad. Dolly became the companion of Miss Haredale when both their lovers had left England.

Five years passed away. The landlord of the Maypole Inn had been told by the bellringer that he had seen the ghost of a murdered man appear to him on the anniversary of the very night on which Mr. Reuben Haredale had been killed, and honest John Willet thought he ought to let Mr. Geoffrey Haredale know of this. He went to the Warren with his news, accompanied by Hugh, his ostler, a rough fellow, but handsome after a wild gipsy fashion, and of great strength. As they were returning they were accosted by three horsemen, who asked if they were on the right road to London. When they knew that it was thirteen miles away, they next asked if there were any inn near, and ended by following John and Hugh to the Maypole. These men were Lord George Gordon, his secretary, and his servant. Lord George was a strong Protestant, and when, in 1780, some laws were proposed to improve the position of the Roman Catholics in England, he determined to contest these laws at all costs.

He roused up the people with his fiery speeches, until the cry of "No Popery!" was heard wherever he went. At this time he was waiting until the moment was favorable for raising a rebellion. The men who joined him were not always men who cared at all



VARDEN DRESSING FOR THE VOLUNTEER PARADE

for religion; many of them were merely anxious for a fight, others had different purposes to serve. His own secretary had been a Roman Catholic, but had changed his religion to suit his own ends, and poor, weak Lord George was little more than a tool in his hands. Ned Dennis, the hangman, was on their side,



BARNABY JOINS THE "NO POPERY" MEN

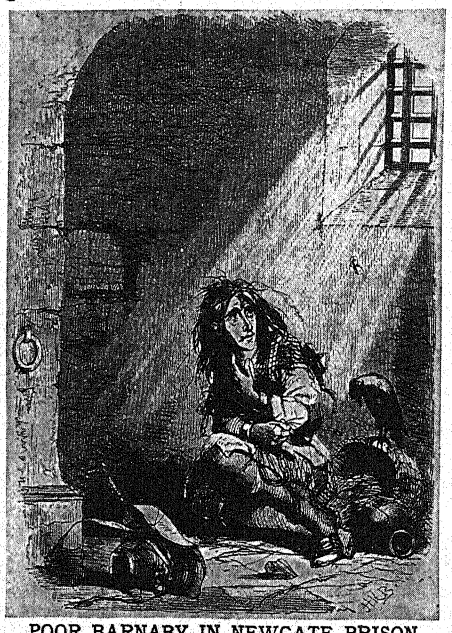
and the lawless Hugh soon joined them. By tempting witless Barnaby with their badge, a blue cockade, they won over that crazy young man, who loved finery of any description, and now, wherever they went, Barnaby went also, carrying in a basket his pet raven, Grip, of which he was very fond. This strange bird had a stock of phrases which he produced on all sorts of occasions, and now he added "No Popery!" to his cries of "Polly, put the kettle on, we'll all have tea," "Grip, the wicked," "Bow, wow, wow!" and others.

Lord George Gordon presented a petition to Parliament against the repealing of the Catholic laws, and in Westminster his followers gathered. These men became uproarious after a time, until the Riot Act was read, the horse-soldiers galloped in amongst the crowd, and many of the rioters were taken to Newgate Prison.

Not long afterwards, Hugh led the men out to the Maypole Inn, where they broke everything on which they could lay hands, drank freely of all the spirits, and finally left John Willet, the fat little landlord, tied to his chair, next making their way to the Warren. Hugh was mindful of certain orders Sir John Chester had given him, and the beautiful old house was

fired, and soon became a smoking ruin. While John Willet remained fixed to his chair at the Maypole, staring vacantly and wonderingly around, a man came in and asked which way the rioters had gone. This man was none other than the sullen stranger who had been there five years before.

As he was leaving the inn, he stopped at a sudden sound—that of the bell from the Warren. It sounded deep into his heart, and he hastened to the old house, hovering about it like a dreadful bird of prey. Presently Mr. Haredale came upon him and threw himself on the man, clutching his throat with both hands, calling him by the name of Rudge, murderer and monster! And, indeed, it was none other than the faithless steward who had murdered his master and the gardener, had dressed the latter up in his own clothes, and had then escaped. His existence had been the secret which the poor widow was obliged to guard, while he extorted money from her, following her wherever she went.



POOR BARNABY IN NEWGATE PRISON

In his cell in Newgate Prison, Rudge explained to a former comrade that he had been unable to stay away from the Warren; that the dead man seemed to draw him there as if he were attracted by a magnet. In this prison, too, poor Barnaby, who had been arrested while acting with Lord George's followers, first met his father. After some time the Gordon rioters burned down the building to procure the release of their friends.

Barnaby and his father, escaping, wandered out into the country, but when the murderer Rudge became ill Barnaby went to find Hugh, and was just in time to see him knocked off his horse in the midst of a crowd in Holborn. Hugh was able, however, to accompany Barnaby to the hiding-place where Rudge was lying, but the next day they were all captured by soldiers, whom Dennis the hangman had told about their escape, when he himself was arrested.

Meanwhile, both Emma Haredale and Dolly Varden had been captured by some of the riot leaders who burned down the Warren and taken to London. Their friends were searching for them far and wide. How delighted they were when they were discovered by Mr. Haredale and Gabriel Varden, the latter of whom had become a sergeant of the London Volunteers at this troublous time. But they were even better pleased to see with them Edward Chester and Joe Willet, even though the latter had come home with only one arm, having lost the other at the defence of the Savannah.

The murderer Rudge, Hugh, and Barnaby were all condemned to be hanged. Hugh's last wish was that he might save Barnaby, as he was sorry for the poor, half-witted boy. As Barnaby was mounting the scaffold, a messenger came with a reprieve for him, which his friends had secured, having spent the whole of the previous night in the effort, honest Gabriel Varden having tried even to see the king on his behalf.

Lord George Gordon was imprisoned, and died at Newgate in 1793. In a duel Mr. Haredale killed his old enemy, Sir John Chester, and afterwards fled the country, dying in a monastery abroad, Edward Chester married the beautiful Emma, and they sailed to the West Indies, where he had amassed a fortune. Joe Willet married Dolly Varden after all, and when he inherited the Maypole Inn, Mrs. Rudge, with Barnaby and the faithful Grip, came to live with them, and the poor youth's mind grew clearer with advancing years.

THE NEXT STORY OF BOOKS IS ON 2861.

WHAT THIS STORY TELLS US

WE have already learned in the previous article on this subject something of the Indians as the first settlers of our country found them. We read of their appearance, their dress, their methods of fighting, how they got their living, and began to tell of some of their strange customs. Now we come to that strange figure, the "medicine-man," who was supposed to have power over disease and misfortune. We shall also learn something of the way the Indians were treated by the white men in old times, and also of their life to-day, for many Indians still live in various parts of the Dominion of Canada.

THE INDIANS OF CANADA

PART II

CONTINUED FROM 2579

THE Indian had a firm faith in dreams. He was advised in his dream where to go and what to do; the individual's own ability or intelligence counted for little; he received his power in dreams, and when in doubt he slept, hoping to receive knowledge. He believed, too, in magic, and as a result each tribe had its sorcerers or conjurers or "medicine-men." They believed illness of the body meant possession by an evil spirit, and their methods of healing took the form of incantations and strange ceremonies for exorcising this spirit.

The medicine-man was a combination of magician and doctor. The tribe believed that with his magic art and his incantations he could heal the sick, cast out evil spirits, or control the weather. His medicine-bag contained many herbs and roots, and charms known only to himself. He practised his "sorcery" in a special tent of small size, in which he invoked spirits of all sorts, using not only the contents of his medicine-bag, but drum and rattle, while he groaned and chanted his weird songs. When asked why he used the noise of drum and rattle in an effort to heal the sick, a medicine-man said that he followed the example of the Great Spirit, who healed the flowers and trees in the summer with the thunder and the rain. The noise of the drum and rattle, he said, was like the roll and rattle of the thunder, and the medicine was like the rain which refreshed the thirsty plants. A great deal of faith was placed in the successful healer, and his herbs, roots, bones, rattle and songs were held to be possessed of mystery, and so were the means of driving out disease. Some of the medicine-men were really skilful in their use of herbs; but they had not even a rude knowledge of surgery.

There are many tales and traditions of the medicine-man's power of transformation, his ability to cast spells or to injure by a "curse," to sink into the earth, communicate at a distance, fly through the air, travel underground, remain under water, and become invisible. Sometimes he claimed to have the power of prophecy; he foretold if the sick would recover, if a journey would be prosperous, if a raid would be successful, where game would be found, what was going on among a distant people. Sometimes he showed how deft he was in sleight-of-hand performances, like a modern magician,—how he could handle fire without being burned, and how skilful he was in all sorts of tricks. These medicine-men or wizards were naturally determined opponents of the early Christian priests. The Indians also believed in witchcraft, but to a limited degree.

SOME INDIAN GAMES AND SPORTS

Although the Indians were stoical and rarely gave external evidence of

Copyright, 1913, 1918, by M. Perry Mills.

their true feelings, they were not without a sense of humor. Among their legends and traditions are many funny stories. They had many games and amusements. They were fond of a sort of game of draughts or checkers; they had dice made of bone which they cast on a wooden plate; and references to games and gambling occur often in their legends. They also had a kind of football game, lacrosse, and other rough and strenuous games of ball. There were several forms of the "throwing stick," and the object sought for in them all was distance. Story-telling was a favorite pastime. They had a number of strange dances and festivals. One of these was the Smoke Dance when a new peace pipe was consecrated, and another the potlach or giving away dance, during which the Indians who took part gave away valuable presents. Singing was one of their favorite amusements.

Musical instruments were made of hoops with pieces of hide stretched over them to form drums or tambourines or "tom-toms;" these and wooden sticks were their only instruments. Their music was simple, consisting only of a few musical phrases repeated over and over. The Indians had love songs, festival songs, war songs, hunting songs, and songs associated with every phase of their life. Many of these songs have been saved by collectors. Children had rattles, dolls and other toys. The old Indians—men and women—smoked a great deal; their pipes were of hollowed-out stone with wooden stems. The pipe of peace was a long sacred pipe used only at peace-making. At the peace conference it was passed from chief to chief, each drawing one breath before passing it on. It was a token of friendship and good feeling. The peace pipe was a treasured possession and was kept carefully wrapped in soft deerskin and fine furs.

The highest limit of art among the early tribes was reached in the pictography or pictures on birch-bark, in bark adorned with the dyed quills of the porcupine, in vari-colored basketry, and in painted designs on skins or hides. Some of the tribes had picture writing; they made use of rude pictures drawn on birch-bark to express thoughts. In most cases these pictures were very realistic representations; they told the incidents of a hunt or the episodes of a myth or legend. The signs did not always convey the same meaning to members of the whole tribe. Some of the tribes had characters or hieroglyphs to express words or ideas or groups of ideas, but they had no written language.

THE NORTH AMERICAN INDIANS NOT ALWAYS CRUEL

It is wrong to suppose that the early Indians of Canada were always cruel and wicked and savage. They were, of course, molded by conditions of the wilderness, by a long and continuous struggle with nature, by constant contact with wild life. But although they were ignorant and superstitious, passionate and revengeful, and at times cruel to their enemies, and proud with a lust for conquest, they had many noble qualities. They were never guilty of low or mean vices; before the coming of the white man with his "fire-water" and his baser habits, they had on the whole a high sense of morality. As a rule, they were kind and hospitable, faithful and honest, and they were capable of great bravery and courage; yet they had a love for liberty, and, because of their wild free life, a natural contempt for systematic rule.

These qualities have not entirely left them. There is no doubt that at first they were friends and admirers of the white men, whose designs they did not suspect. Jacques Cartier, telling of his visits to Canada in 1534 and 1535, wrote: "In St. Martin's Creek we saw a great number of the wild men; they were on shore making a great noise, beckoning us to land, showing us certain skins upon pieces of wood, but because we had only one boat we would not go to them, but went to the other side. They, seeing us flee, followed, dancing and making many signs of joy and mirth, as it were desiring our friendship. . . . They gave us whatsoever they had, not keeping anything . . . and made signs that the next day they would bring more skins. . . . As far as we could perceive and understand this people, it were an easy thing to bring them to some familiarity and civility, and to make them learn what one would."

WHY THEY GREW TO DISLIKE THE WHITE MEN

Soon, however, the Indians became suspicious, and mistrusted the European visitors. Cartier kidnapped a chief and took him to Europe; then the fur traders deceived them, and took their territory,

INDIANS AS THEY LOOK TO-DAY



These squaws of the Coast Indians, living near Vancouver, do not look much like the beautiful Indian maidens of whom we read in poems, though some of them are young. Perhaps they would look better in Indian dress, for it takes time to learn to wear strange clothes without awkwardness. They seem good-natured, though some of them have endured much hardship, and they have intelligent faces.



These Montagnais Indians in the Lake St. John district have given up many of their old customs. Nearly all of them are Christians. Their reservation is on high land near the lake, and the country to the north of them is not well known. Here again they appear awkward in our dress. The men make excellent guides and boatmen, and are skilful fishermen. Notice the canoe in which the little ones are seated.

Photographs by Notman, Montreal.

and made them the victims of commercial greed. The sixteenth century was a period of intermittent warfare between the white settlers and the Indian tribes, and the early immigrants were in constant terror because of the sudden and secret Indian raids upon them. In the seventeenth and eighteenth centuries, there was greater friendship between the Indians and the French or the English.

In the Maritime Provinces the French immigrants were kindly received by the natives and allowed to settle on their lands without objection, and friendly relations were established and maintained with few interruptions. This friendship was due largely to the numerous marriages of Frenchmen with Indian women. In the wars between the English and the French for the possession of Canada, which ended in 1759, the Indians had a very large part and influence, and had they been united they could have expelled the white invaders. Frequently they held the balance of power between the two nations, and because of their knowledge of the country, and of forest fighting, and their skill on the lakes and rivers, their assistance was eagerly sought. Roughly speaking, the Algonquins and Hurons helped the French, while the Iroquois and some smaller tribes helped the English. After the Iroquois in their cruel tribal wars had practically destroyed the Hurons, they attacked the French, and several times they brought the white settlements along the St. Lawrence to the verge of destruction. The story of The Girl Who Held the Fort, told elsewhere, gives an idea of those perilous times.

The Indians had many famous warriors and leaders. Among these is numbered Pontiac, who, in 1763, formed the famous project of uniting several Indian tribes against the British. He was a man of great genius, shrewdness, and cunning. Another famous warrior was Tecumseh, who fought for the English in the War of 1812, and was killed at the battle of Moraviantown in 1813. He, too, was a remarkable man, famous for his courage, his eloquence, and his skill as a leader in battle. After the fall of Quebec and the end of hostilities between the French and the English, the Indians of Canada dwelt in comparative peace, except for attacks in the late eighteenth century on greedy and dishonest traders, and on colonists who treated them harshly.

EARLY ATTEMPTS TO CHRISTIANIZE THE INDIANS

The first attempts to civilize the Indians were made by the Jesuits. The black-robed missionaries spread over Canada at an early date among the Iroquois and the Hurons. They were not always kindly received; they suffered many hardships, and many of them were tortured and put to death by the Indians to whom they brought the Gospel. Brébœuf is one of the most famous of their martyrs. Missionaries from other churches and orders spread amongst them, and slowly the majority of the Indians became Christianized. To-day most of the formerly pagan Indians have joined one or other of the Christian denominations, and although some keep to the superstitions and customs of their forefathers, there is every indication that in a few years the whole native population will be converted to Christianity.

WHERE THE INDIANS NOW LIVE

Nearly all the Canadian Indians now live on "Indian Reservations,"—tracts of land given to the tribes by the Canadian Government in return for the territory taken from them at the beginning of colonization. They are not confined to these reservations, but are allowed to roam and hunt at will, subject to the white man's laws; the reservation, however, is the recognized and undisputed home of the tribe settled upon it. Here are the small houses or tents of the people, usually a school, and sometimes a church. Members of the tribe, too, have blocks of land which they cultivate; they follow a civilized mode of life, although they still retain many of their old beliefs and customs. They are under government supervision, through a white Indian-agent or supervisor, and they receive an annual grant of money, provisions, blankets, and seed-grain according to their needs. A few in the far north still wander as of old, without a permanent reservation.

The Indian tribes extend to-day from the Atlantic to the Pacific. The principal remaining tribes are the Micmacs and the Malecites in the Maritime Provinces, and the Abenakis, the Montagnais and the Algonquins in Quebec. The Hurons, once a very powerful race, have but a small remnant, less than three hundred, at Lorette, near Quebec City; the ruins

of their forts may still be seen in the rich farmlands between Lake Simcoe and the Georgian Bay. The Six Nations are in Ontario and Quebec. Numbers of the Six Nations of the Iroquois tribe, who lived in New York State before the Revolution, went up to Canada when the war was over, and were given large grants of land. Some of them settled near Kingston. Others went farther west to the Grand River. These Indians are farther advanced than the other tribes and many of them have comfortable houses and fairly well tilled farms. The Ottawas and Delawares are in Ontario; the Ojibways and Chippeways are in Ontario, Manitoba and the Northwest. The Crees are the most numerous; four-fifths of them are in the Northwest, and the remainder are in Manitoba, Ontario and Quebec. The Blackfeet are in Alberta; the Slaves and Dog Ribs are along the Mackenzie River; and in British Columbia there are many distinct tribes.

HOW THE INDIANS ARE LEARNING TO LIVE LIKE WHITE MEN

The Indians in Canada to-day are a quiet and peaceable, law-abiding people. Like most ignorant races, however, they are easily stirred up, and they sometimes talk unreasonably about their rights and privileges, and about the freedom they have lost. As they are brought more into contact with civilizing forces, they continue to give evidence of increased self-reliance and industry. Their children go to school, and learn readily. As a rule, they are hardy, although, because of their small houses, disease has spread among them. They have produced some noted runners and athletes.

According to locality, the Indians usually become cultivators of the soil, stockmen on cattle ranches, fruit pickers and packers, loggers, guides, and boatmen. Those who live by the sea or lake or river are expert in sealing, fishing, or hunting for fur; they sell the products of their labor to the whites. At times they work in saw-mills, in log camps, and in canning factories. They are also expert at handicraft, and they sell in large quantities axe-handles, tubs, rustic garden-seats, hockey sticks, snow-shoes, toboggans and other articles.

WHY THEY DO NOT PROGRESS FASTER TOWARDS CIVILIZATION

As canoemen and boatmen they are unexcelled. The women, too, are money-earners. They make bright-colored baskets, boxes ornamented with dyed porcupine quills, and beaded cushions, all of which they sell to tourists; they pick and sell great quantities of berries; they make pretty mats from the inner bark of the cedar; and they cure and dress skins, from which they make gloves and beautiful beaded moccasins. Yet the Indians in their labors are not systematic; they naturally despise rules; they work in fits and starts, and they dislike hard or continuous physical effort. The problem of making a living has always been a very easy one with them, and as a result they work only long enough to get a certain amount of food and clothing; then they stop, and work again only when this food has disappeared. There are, of course, exceptions; many are very industrious; some, too, qualify to be teachers in the government schools of the tribes. There have been professional men among them.

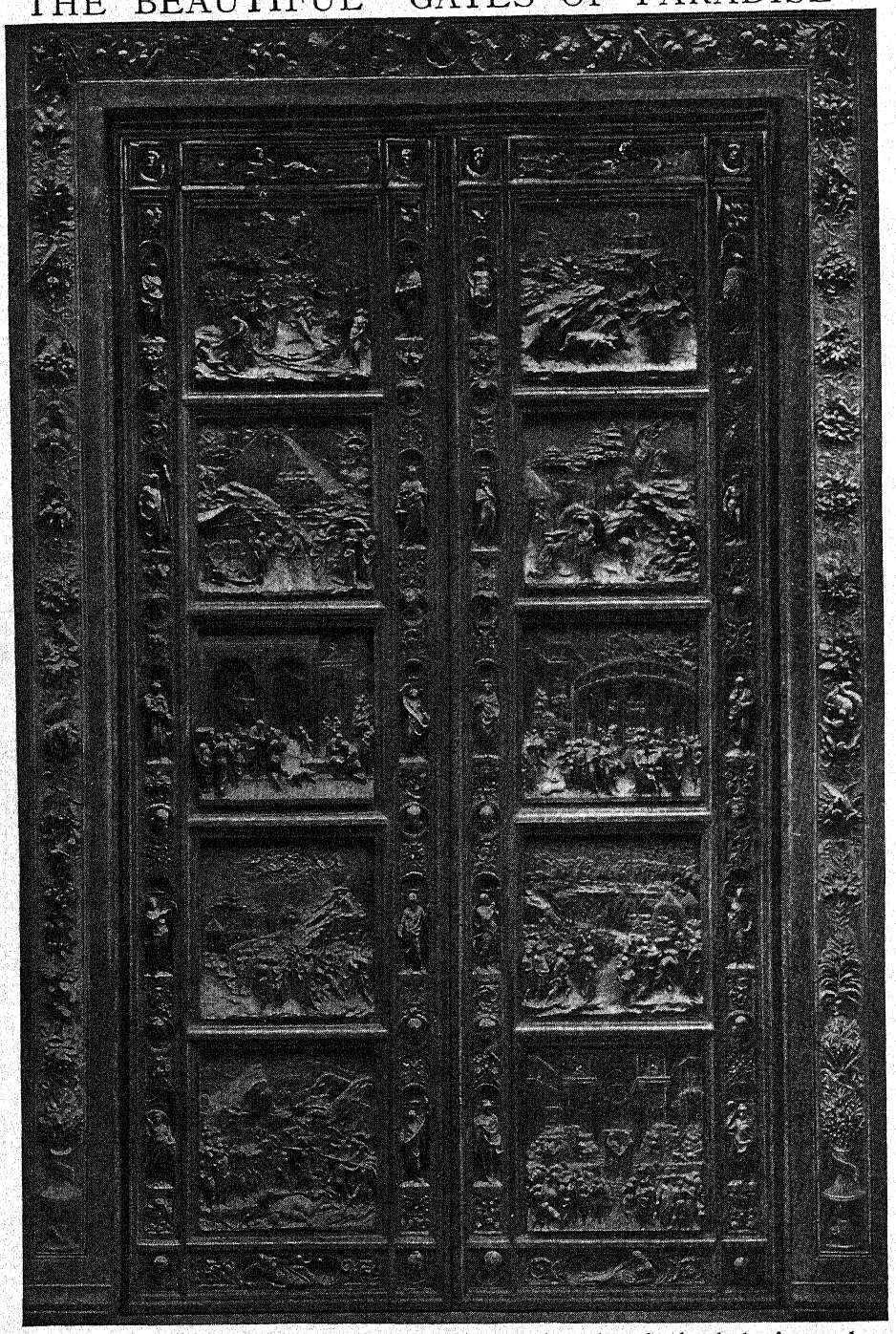
The Indians we see to-day in our towns and villages, in forest or on lake or river, are descendants of a once mighty people who had a great influence in the early days of our country. They have greatly decreased in numbers, but under the forces of civilization they have made very wonderful progress. In 1912, over eleven thousand Canadian Indian children were in attendance at industrial schools; the Canadian Indians had nearly sixty thousand acres of land under cultivation, of which the total production amounted to nearly a million and a half dollars; and wages and the proceeds from various industries amounted to nearly two million and a half dollars.

WHAT WILL FINALLY BECOME OF THE INDIAN RACE

The Indians in Canada in 1911 numbered slightly over one hundred and three thousand. Disease, because of the unsanitary conditions of their dwellings, will gradually diminish them. On account of their intermarriage with the white people, they will become absorbed in other races, and years hence, because of death and absorption, it will perhaps be hard to find a full-blooded Indian as our ancestors knew him in the early pioneer days of our country. In time the Canadian Indian will vanish from the earth. But he will have left his stamp deep on the pages of Canadian history, and he will not be forgotten.

THE NEXT STORY OF CANADA IS ON PAGE 2877.

THE BEAUTIFUL "GATES OF PARADISE"



In the open streets of Florence, where the rain has poured on them for hundreds of years, hang these wondrous gates. They are the main gates of the little baptistery which was the chief church in Florence before the great cathedral, now facing it, was built. They are, perhaps, the most famous gates in the world, and they took nearly thirty years to build. They were designed and carried out by Lorenzo Ghiberti, who began them in 1425 and finished them in 1452. Michael Angelo thought them fit to be the gates of Paradise, and they are among the most wonderful things in a wonderful city.



THE BUILDERS OF FLORENCE

CONTINUED FROM 2718



AMONG the many cities of Europe that we desire to visit, none calls to us more clearly than the ancient city of Florence, which lies in the lovely valley of the Arno. An old legend says that it was built by Julius Caesar, who called it Fiorenza, and though learned men say that this is only a pretty tale, we know that the city was founded by the Romans.

Italian cities commenced the struggle against feudalism early in the Middle Ages, and cities such as Venice, Genoa and Pisa became powerful states. Florence was slower to rise. Fiesole, on the mountainside above her, and the castles of the nobles round about, were for centuries too strong for her. But in the twelfth century, the citizens of Florence were able to overthrow the people of Fiesole, and soon became so strong that they were able to ruin the strong places of the nobles, and compel them to live within the walls. After that the city was time and time again convulsed by party strife, for the nobles, who were banded into a faction called the Ghibellines, tried to impose their will upon the citizens, who were called the Guelphs. But at length, the power of the nobles was broken.

Every trace of serfdom was destroyed, and the government of the city was placed in the hands of the heads of the great guilds, as representatives of the people of the city.

The guilds of the Middle Ages were the associations, or unions, in which the citizens united for protection. Every citizen, whether he was occupied in the arts or in some trade, belonged to a guild, and many guilds brought great fame to their cities. Florence was noted for its cloth and furs, its silk, its gold and silver brocades, and especially for its bankers. Representatives of the great guilds were sent to every capital in Europe, and in the days of its early glory, two hundred years and more before Columbus was born, it was the home of great artists and learned men. In spite of many misfortunes, Florence was enormously wealthy, and it was natural that men who loved their city, who had fought for it, and whose fathers had died for it, should turn their attention to making it beautiful.

We marvel at the beauty they have left us, and it adds to our amazement to remember that when she was made beautiful Florence was already centuries old. The wonderful thing is that the city found ready, in the course of

Copyright, 1918, by M. Perry Mills.

no very long time, the men capable of carrying out, in the best possible way, the high ideals from which the search for beauty grew. Architects and sculptors arose whose works have seldom been excelled in the history of the world. Many of them sprang from such humble circumstances that we do not know their early history.

HOW ARNOLFO BEGAN THE GREAT WORK OF MAKING FLORENCE BEAUTIFUL

One of these men of humble birth is Arnolfo di Cambio. We meet him first in the company of a band of workmen who were engaged with him at work in the cathedral of Siena. He was still a young man, having been born about 1232. With him was a man named Lapo, whom he sometimes called his father and sometimes called his teacher. All these workmen were skilful artists, going from town to town in Italy, beautifying existing buildings or putting up new ones. It was Arnolfo that Florence chose to begin her great work of beautifying the city. The young workman became suddenly renowned as an architect and sculptor, and while similar tasks were being attempted in the neighboring cities, he went swiftly to work to give Florence some of the buildings which to this day help to make her famous.

He was the father of her architecture. He surrounded the city with stately walls, he built her noble cathedral and two of her most beautiful churches, and he planned the famous public palace of the city, where the governors of Florence held their meetings. But Arnolfo could not finish all the great works that he began. He died in 1300, leaving much for those who followed to complete.

HOW CIMABUE BEGAN PAINTING REAL PICTURES AND FOUND GIOTTO MINDING SHEEP

While Arnolfo was creating wonders in stone, a Florentine named Giovanni Cimabue, born in 1240, was adding to her pictorial treasures. The art of painting had at this time fallen very low in Italy. Foreigners, who copied bad models, ruled the world of art. Cimabue began, as other young artists began, by copying these unsatisfactory models. Soon, however, his independence made him strike out for himself, and to paint men and women and the things about him as they really seemed. Because he tried truly to paint as he saw things, he is honored with the title of the Father of Modern Painting. He died two years after Arnolfo, in 1302. But before he died he had trained a greater than himself to succeed him. This was Giotto di Bondone, always called simply Giotto.

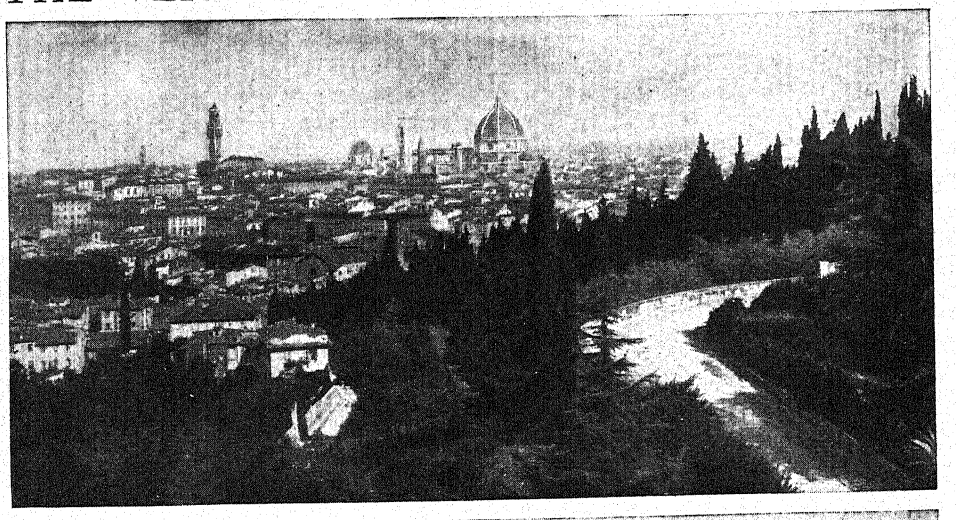
Giotto was born in, or about, 1266, the son of a peasant at Vespignano, near Florence. While he was still a little boy, Giotto was placed by his father with some shepherds to watch his flocks. Giotto may have been a loving shepherd, but he loved art better. Without having had a lesson, he used to give all his leisure to drawing on the rocks with chalk. It is said that while thus engaged one day making a skilful drawing of a sheep, Cimabue found him. The great artist, pleased at the boy's industry and talent, asked if he would like to go with him and learn to paint. Permission having been gained from the boy's father, Giotto was taken to Florence and instructed by his good friend. Giotto proved a ready pupil. He learned all that Cimabue could teach him, and became greater than his master.

GIOTTO, THE LAUGHING ARTIST WHO TALKED MERRILY WITH A KING

Cimabue had paved the way for a great change in the methods of artists; Giotto was really the first to give it expression. He was about twenty-four when he gained his first important commission. This was to paint a picture of Paradise over a church altar. An interesting thing happened about this. Dante, the great poet of Florence, was at this time living in his native city, and had shown himself a friend of the young artist. So, as Giotto sat perched high up on his little platform near the roof of the church, he thought of what he owed the poet, and showed his gratitude by painting a beautiful portrait of Dante among the angel faces of his picture. That portrait is the finest of the great poet that we have, for it was painted before sorrow and care had marred the noble features of Dante.

Giotto's talent was speedily recognized. He was paid to do paintings for the famous church in which St. Francis of Assisi is buried; for churches at Rome, Padua, Verona, Naples, and elsewhere, and, of course, for many in Florence.

THE VERY GREAT HEART OF FLORENCE





Florence has grown up, as it were, in the bottom of a basin, with majestic hills rising round about it as if to defend it from the rest of the world. When the people had won their way to freedom, their love of beauty burst forth, and a school of great artists arose. The citizens still lived simply. They used their wealth in beautifying the city, and one artist vied with another in its adornment. Because the people had faith that the place where they worshipped was the House of God they used their best efforts in making it worthy of its name, and churches and towers and domes began to rise ; and there grew up the wondrous sight we see in these photographs—the great black and white marble cathedral with the wonderful dome, the quaint little baptistery in which for a thousand years every child of the Florentines has been taken to be baptized ; with the towers and roofs of the little crowded red-tiled city packed closely round about.

Wherever he went he was always the simple laughing peasant turned artist. He had a merry jest for everybody, whether it was king or clown. Said a king who employed him: "I wouldn't work upon that scaffold this hot day if I were you." "Nor would I if I were you," answered the laughing artist.

How Giotto made a plan for the Pope and went to Rome

On another day he and a great lawyer were caught in a storm, and as they went their way, drenched and plastered with mud, the lawyer turned to Giotto, and, noting how comical he looked, said: "Do you think that anybody seeing you at this moment for the first time would believe that you are the greatest painter in the world?"

"Yes," said Giotto, "if he could believe that you knew your A B C."

Another joke of Giotto's is told at the expense of the Pope. The latter sent a great man round to all the cities to collect specimens of the work of the artists, saying that the painter whose work he liked best should go to the Vatican to carry out a great scheme of decoration. The other artists were anxious to show the best thing they had done; but Giotto was not at all concerned. He took up his brush, dipped it in red, then drew with it a circle, so perfect that it looked as if it had been drawn with compasses. "Here is the drawing," he said, handing it to the envoy.

"Am I to have nothing but this?" gasped the man.

"That is enough, and too much," answered Giotto. "Send it with the others, and see if it is understood."

Apparently it was understood, for it is said that the Pope sent for him, and that he painted some pictures in St. Peter's at Rome.

The beautiful tower of Giotto that stands in the streets of Florence

When he was an old man, only two years from the grave, Giotto was made master of the public works of Florence, and given charge of the building of the cathedral, left incomplete, as we have seen, by the death of Arnolfo, about thirty years before. Not only had Giotto now to superintend the work of others; he had to create, with measuring instrument, with hammer and chisel, as he had been wont to create with his paints and brushes. He was called upon to design a campanile, a tower in which to hang bells. He did the work with as light a heart as if it were an every-day occurrence. He planned and designed one of the most beautiful towers ever built. It is one of the marvels and beauties of Florence to-day, and visitors are proud to bring away from Florence bronze models of it. Not only did Giotto plan it, he worked with mallet and chisel at some of the carvings which adorn it. One of the carvings represents a little puppy, a puppy, it is said, which he had loved as a child when minding the sheep, and had remembered, years and years afterwards, when he was one of the most famous men in Italy.

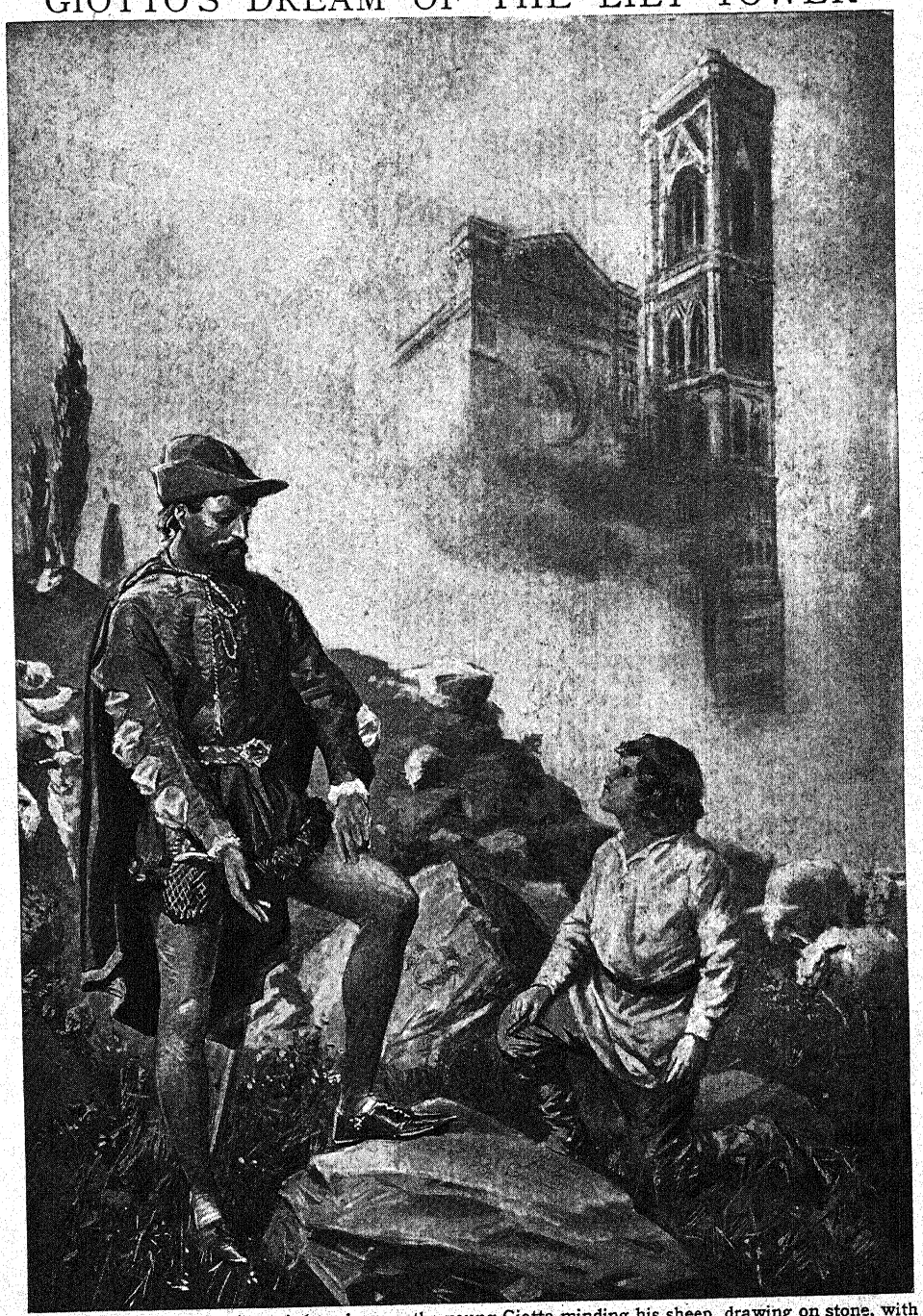
The beloved Giotto passed to his rest in 1337, and we have now to go forward and leave the work of making Florence beautiful to artists of skill, but less famous than those whom we are considering. We take up our story again when we find in Florence three other wonderful men. These are Filippo Brunelleschi, born about 1379; Lorenzo Ghiberti, born in 1378; and Donato Di Betto Bardi, called Donatello, born about 1386.

The gates for which all Italy's artists made plans

The first two came into prominence when Ghiberti was about twenty-four, and then met as friendly rivals. Ghiberti was of poor family. We know nothing about his father, but we hear of his step-father, an excellent man, named Bartoluccio, who instructed young Ghiberti in his art as a goldsmith, then did a wise thing by sending the lad to travel and enlarge his knowledge of art, and, at the same time, to earn his living.

Ghiberti was a wonderful fellow. When he was not painting pictures he was modeling in wax, or making figures in bronze, or doing something with trinkets. Before he turned his face homeward, he had earned fame by painting some fine frescoes in a palace at Rimini. He was working at Pesaro when he got a letter from his anxious stepfather telling him that all the most skilful artists in Italy were summoned to show their genius in designing gates of bronze for the famous church of San Giovanni, the church to which all the children of Florence were then, as now, taken to be baptized. Here was Ghiberti's chance. He needed not his

GIOTTO'S DREAM OF THE LILY TOWER



In this picture the artist has tried to show us the young Giotto minding his sheep, drawing on stone, with rough chalk for pencil, as Cimabue found him ; and the artist has fancied Giotto dreaming of the beautiful tower which he was eventually to raise in the streets of Florence. As we look at the Shepherd's Tower, so pure that it is called the Lily Tower, there comes to us something of the feeling that must have been in Giotto's heart when he chiseled his marbles. The foot of this tower, says Mr. Ruskin, is the one spot, out of Palestine, where we feel the dawn of the morning of the world. Behind us is the little baptistery, the last building set up on the earth by the men who learned their work from pagan teachers ; in front of us is the best building set up on the earth by the men who learned their work from Christian teachers.

LOOKING DOWN A FLORENCE STREET

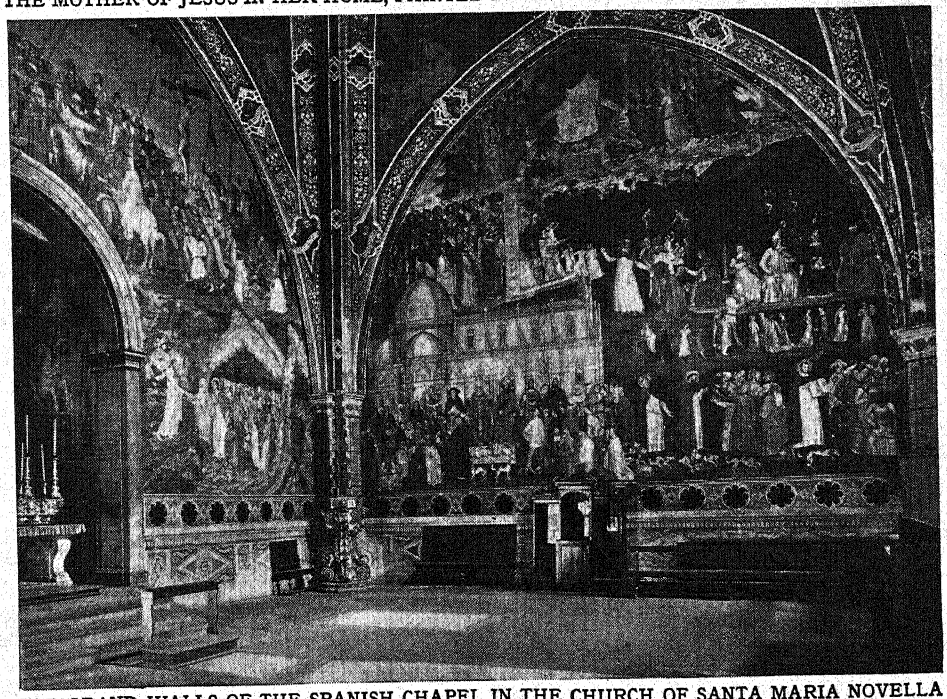


We have in this picture one of the most striking glimpses of the streets of Florence. On the right and left are the long corridors of the famous Uffizi Gallery, full of priceless paintings, and beyond, rising to a marvelous height, is the wonderful Vecchio Palace, built of huge stones hundreds of years ago. Here Lorenzo the Magnificent held his luxurious court, patronizing painters and sculptors; here, in a little cell at the top of the tower, Savonarola, the eloquent monk who preached to the Florentines, spent his last night on earth. In the niches between the columns are statues of some of the great men of Florence.

THE CHURCH WALLS OF FLORENCE



THE MOTHER OF JESUS IN HER HOME, PAINTED IN THE CHURCH OF SANTA MARIA NOVELLA



THE GRAND WALLS OF THE SPANISH CHAPEL IN THE CHURCH OF SANTA MARIA NOVELLA

Florence holds us captive everywhere, indoors and out. The walls of its churches are covered with priceless paintings. No picture can represent them as they are, but we give here two photographs of the walls of the church of Santa Maria Novella, which help us to understand some of their splendor.

The photographs on these pages are by Underwood & Underwood, London, and Alinari, Anderson, Brogi, and Manelli, Italy.

stepfather's bidding to hasten home; so anxious was he to reach Florence that the journey seemed to him, as he said, like a thousand years. He drew his plan, and sent it in to take its place with the designs of the most famous men of the time.

THE GREAT CHANCE OF GHIBERTI'S LIFE AND THE USE HE MADE OF IT

Among the other competitors was young Filippo Brunelleschi. He was a lawyer's son, and his father had desired him to follow the law. But Filippo early gave his heart to the work of the goldsmith, and dearly he hoped now to win the prize. When the designs were exhibited he took with him his humble young friend, Donatello. They examined them all, and saw that Brunelleschi's was better than all save that of Ghiberti, which was superior to all the rest. And so the judges found. Ghiberti was ordered to undertake the work; this young wandering workman of twenty-four was chosen before all the other artists who competed.

To understand what Ghiberti had undertaken we must examine the picture of the gates, on page 2786, or, better still, if we cannot go to Florence, we may see a cast of them in the Corcoran Museum in Washington, or in the Metropolitan Museum in New York. It proved to be the work of Ghiberti's life. The first pair of gates took twenty years to make, and the second pair, shown in our picture, even longer. Thus fifty years of his career were given to the work. But while Ghiberti was doing the gates with the assistance of a staff of artist-workmen, he was engaged in other labors, too. He did some beautiful work for two or three churches of Florence, as well as for the cathedral; he modeled fine statues, and did some beautiful goldsmith's work.

THE GATES THAT MICHAEL ANGELO SAID WERE FIT TO BE THE GATES OF HEAVEN

Ghiberti was even given part share with Brunelleschi of the building work at the cathedral, but here as a builder he was a failure. Brunelleschi could not work with him, and had to refuse to go on unless Ghiberti were kept to work of his own; and, even when they were able to give him his own work, Ghiberti was found to be incompetent, and was removed. His grandest monument is the wonderful pair of gates, which for mingled grace and grandeur are finer than anything else of the sort in existence. Michael Angelo declared that they were fit to be the gates of heaven. Ghiberti loved the work, and he gave the best of his life to it. Though its progress was so slow, all the most exalted people in Florence were interested in it. In those days Florence was an unlighted city at night, save for the torches which people carried, and everybody not specially authorized had to be indoors by dark. But Ghiberti, though no higher in rank than the rest of the common people, became a great public character when he began the gates, and he and all his work-people were allowed to walk about the streets at night and to carry lanterns, at whatever hour of the night they liked—a rare privilege indeed in those days.

It was well for Filippo Brunelleschi that he did not get permission to make the gates, for there was other important work for him to do, even greater in some respects than Ghiberti's. Himself an ugly little man, he had a soul for beauty, though not one of the kindest of natures.

HOW BRUNELLESCHI BUILT THE DOME THAT IS STILL THE GLORY OF FLORENCE

Having failed in his contest with Ghiberti, he went off to Rome to indulge his passion for architectural drawing. He had already sketched every building in Florence, and he longed to make a new drawing showing how Arnolfo's grand cathedral could be completed by the addition of a dome. So at Rome he studied all the great buildings. He made drawings of them; he noted how they were constructed, how beauty was combined with strength, and lightness with mass. In order that he might have money to live on, he would work during the day for the goldsmiths, then at night go on with the drawings of his beloved buildings. Never did a man more thoroughly train himself for a task than did young Filippo for the dome of the Florence Cathedral.

At last, in 1417, when he was forty years of age, he returned to Florence, and offered to the city authorities plans for the building of a dome. It took the wise men of Florence several years to come to a decision. In that time every sort of objection was raised, and

A STREET CORNER IN BEAUTIFUL FLORENCE



It is a wonderful thing to walk about the streets of Florence. If we have any love of the beautiful, or any sense of the mystery of the past, there comes to us something of the feeling that poetry gives. We seem to be out of the everyday world, and in a beautiful dream. This picture shows us the wonder that bursts upon our view as we turn a street corner in Florence. We are at the famous meeting of the ways in the Cathedral Square, at what is called " the very great heart " of a city that has drawn men to it for a thousand years. All roads lead to this square, and the dome of the great cathedral and the majesty of the Lily Tower are even more impressive in this nearer view than they appear to us from the hills around.

everybody's opinion was taken. Other artists made designs, and the wildest of schemes were suggested for carrying out the work. But in the end Brunelleschi gained the day, and was told to carry out his plans. His one sorrow was that Ghiberti, who now stood high in public favor, was to share the labor with him. Brunelleschi knew that Ghiberti was quite incapable of doing the work, and felt that he himself would have all the labor, but would have to divide the honor, as well as the payment, with Ghiberti. That is why he fought against Ghiberti, and eventually got him discharged from the work.

The dome took over forty years to build, and Brunelleschi had been fifteen years in his grave when it was completed. But his plans were so perfect, his methods so excellent, and his personal labors during the last twenty-six years of his life so persistent, that the faithful band of workers who followed him had but to carry to the obvious end what he had begun, to make his work one of the grandest features in the architecture of Europe. He crowned with a dome of grace and splendor the majestic cathedral begun exactly 150 years before the dome was finished. Measured across, the dome is still one of the biggest in the world, and its beauty remains unsurpassed.

THE MERRY DONATELLO AND HIS WONDERFUL FIGURES IN STONE

So far we have met Donatello only by name. He was the young friend who went with Brunelleschi to see Ghiberti's drawing for the gates. He was one of the merriest fellows, and perhaps it was because of the youth's sunny nature that Brunelleschi, who was ten years older, became his friend and companion. Donatello was the son of a wool merchant, who apprenticed him to a man who is supposed to have been Ghiberti's stepfather. At any rate, the boy learned, like Brunelleschi, the goldsmith's art, and, going to Rome with his friend, was able to support himself there by his skill in working in metals.

While Brunelleschi was studying the classic architecture of Rome, Donatello was studying the statuary. He had not his friend's capacity for great schemes and buildings, but he had just as fine a genius, and though he laughed and joked his way through life, he was destined to become Italy's greatest sculptor of later times, and the father of modern sculpture.

Before he went to Rome as a boy of fifteen he had carved a crucifix in wood, a statue of Mary Magdalene, and a marble statue of St. John, each of which may still be seen in Florence to-day. When he returned from the Eternal City, as Rome is called, he was twenty-one, and a finished sculptor.

DONATELLO'S STATUES FOR GIOTTO'S TOWER, & HIS FIGURE OF ST. GEORGE

Giotto's noble tower still needed some decoration, and Donatello was one of the sculptors engaged to complete it. He carved for it a lifelike figure called Zuccone, and as he gazed upon his finished work he took up his mallet, and, giving the statue a playful tap, said to it: "Speak!" Michael Angelo, who was not born until nine years after the death of Donatello, saw one of Donatello's famous statues. This one was the wonderful figure of St. George, clad in mail, looking as if it is ready to step down from its pedestal and do battle against wrong-doing and evil. And as Michael Angelo looked, he remembered what Donatello had said to Zuccone, and he himself now shouted: "March!" Could there be a finer compliment to a great sculptor's work?

All Donatello's statues are famous. They are beautiful in themselves, but they are important because of the effect they have had upon later sculpture. He had closely studied the glorious work of the ancients, and he reproduced their methods, stamped with his own genius. Until his day, men had been content to let the statues they carved be part of the buildings to which they belonged, as a cornice or a scroll is part of a building. Donatello made them actual portraits in stone, things of life and beauty, independent of their surroundings; figures whose merits command attention and admiration for themselves.

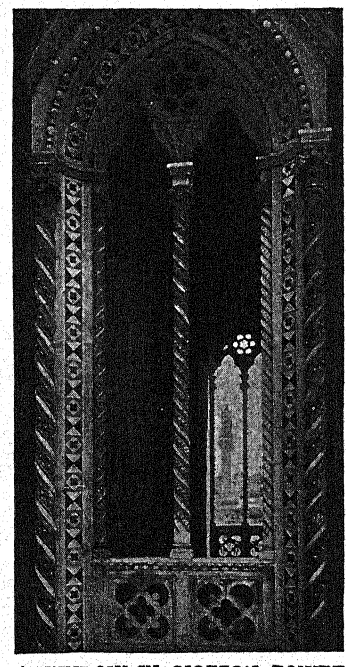
THE MODESTY OF DONATELLO, AND THE FAME OF THE DELLA ROBBIA FAMILY

From his thinking so highly of his work that he bade one of his statues "speak," it might be thought, perhaps, that Donatello was a vain man. But he was not. When people greatly praised him for his work in Padua, he said that he must return to Florence. "If I stay here, where I am praised by

everybody," he said, "I shall soon forget all I know. At home in Florence everybody abuses me, and thus I am kept up to the mark, the constant blame forcing me constantly to study and, consequently, to do better work."

He had a joke and a kind word for everybody who deserved them, but once when a niggardly man complained that the sum charged by Donatello for a great head amounted to 25 cents a day for a month, he took his hammer and smashed his work to pieces.

It was not that he cared anything about money. All that he earned he used to put in a basket and hang up in his workshop, so that his friends and workmen could help themselves without troubling to ask him. He lived through a happy old age, and died when he was eighty.



A WINDOW IN GIOTTO'S TOWER

The lives of the men we have so far studied show us that the decoration of Florence was an unbroken series of works, spread over many years. The next man of genius to carry on the work was the great sculptor, Luca Della Robbia. He was born in Florence in 1400, and was one of Ghiberti's pupils. He took to art as naturally as Giotto had done, and showed such skill in working with marble and bronze that in 1437 he was ordered to complete the series of carvings in relief on one of the sides of Giotto's campanile.

The work was so beautifully done by Luca that it is hard to tell his work from that done by Giotto at his best. Donatello had done some famous carvings in the cathedral, and Luca was given the task of carving a similar set for another part of the cathedral. Donatello's were wonderful, but Luca's were even better. They were figures of singing angels and dancing boys, and were beautiful as the hand of man could make them. A copy of these may be seen in some museums.

This was not the only time that Luca Della Robbia and Donatello were rivals. The jolly Donatello was ordered to make a bronze door for one of the cathedral chapels, but he was too busy, or too happy, in doing other things, so the work was taken from him and given to Luca. The latter took twenty-one years over his task, but it was work fine enough to have occupied an artist a lifetime. The door is divided into ten panels, and the figures in it seem alive.

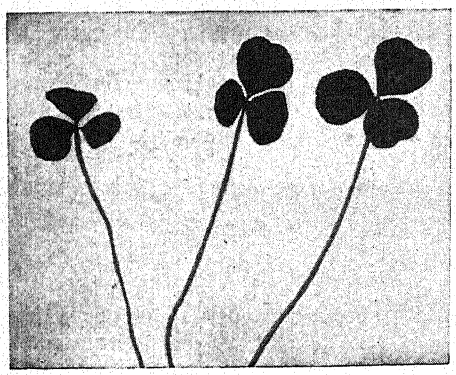
The statues done by Luca were excellent, and one, of the Bishop of Fiesole, is still famous. Much of his time was given to work in terra-cotta reliefs, that is, figures standing out from the flat surface from which they are modeled. These he tinted in soft, beautiful colors, and then covered them with a glaze and fired them. The glaze was already in use for majolica ware, but he improved the process of making it so much that it was called by his name.

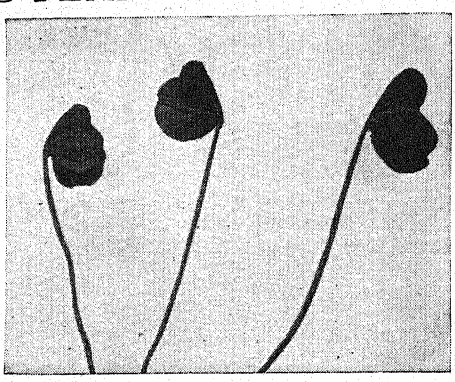
There were other Della Robbias after Luca. He taught his nephew, Andrea Della Robbia, and Andrea taught five of his seven sons, of whom Giovanni was, after Luca and Andrea, the most famous of this talented family. Two of the seven sons became monks in order to follow Savonarola. These two sons of Andrea would thus be drawn into the company of Fra Bartolommeo, who, born in 1475, became one of the most renowned of Florentine artists working at the monastery of San Marco, where also worked Fra Angelico, another famous artist monk, of whom we read elsewhere.

Afterwards there came to Florence the great Raphael, of whom we read on page 762. He was eight years younger than Bartolommeo, but he was able to teach Bartolommeo, and the monk was able to teach him. We read Michael Angelo's wonderful life in the story of the makers of Rome, but Florence was the city of his birth. He was born there in 1475, and carried out there some of his finest work.

THE NEXT MEN AND WOMEN BEGIN ON 2937.

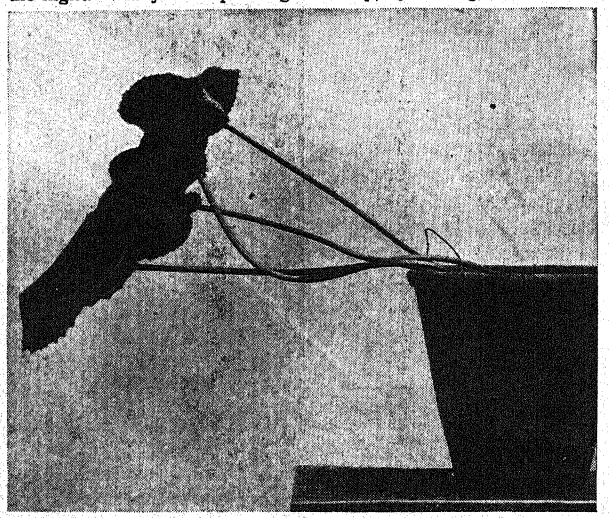
PLANTS THAT SEE AND PLANTS THAT FEEL



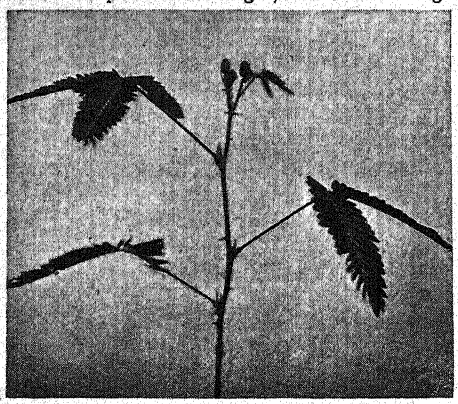


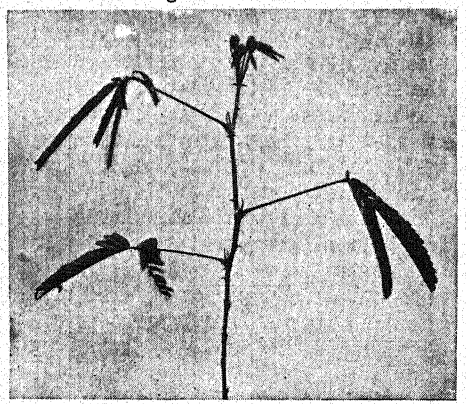
We read on page 1284 how the dark is a great help towards making us sleep, and the darker the room the more soundly we sleep. Plants, too, are very sensitive to light, as these two photographs show. The left-hand picture shows us clover by day, and that on the right shows us the same three leaves closed after sunset, so that they shall not feel the cold of the night. Many other plants go to sleep, by closing their leaves.





In order to grow up strong and healthy, all plants must have light. All leaves turn outwards towards the light, as the photograph on the left shows us. Some are so eager for light that they will move towards it like the plant on the right, which seems eager to stretch itself right out of the window near it.





Plants are not only affected by light, but also by touch. These pictures show us the Sensitive Plant, which is so called because the leaves close up at the slightest touch, as shown in the right-hand picture.

The photographs on this page are by Leonard Bastin, and that on page 2803 by Valentine.

WHAT THE WISE MAN TELLS US

"CAN the flowers see?" "Certainly not," we would answer emphatically; and yet the Wise Man tells us that they do see, many of them having little eyes that are especially sensitive to light and take impressions somewhat like the lenses of a camera. Light, the Wise Man says, is not a thing, but a state of motion or vibration in the ether, or a kind of electricity. "But ether, what is ether?" and the Wise Man answers that question too, for there seems to be nothing that he does not know. He tells us here why it is that we see stars when we are hit in the eyes; why red will irritate a bull to uncontrollable fury; how the forests that turned into coal came to be buried so deep in the earth that the poor miners have to live half their lives in the dark in order to get the fuel that gives us light,—these and many other things he tells us,—but we must read with attention if we wish to remember.

CAN THE FLOWERS SEE?

CONTINUED FROM 2736

WE know now that, though no one would say that plants perceive the images of things as we do with our eyes, yet they certainly can see. Nearly all the leaves of plants are so made that they act as lenses, and it is possible to take photographs by using leaves for the lenses of the camera. The leaves that are best in this respect seem to be those grown in shady places, where light is especially precious. These leaf-lenses have two useful purposes. They seem, in the first place, to concentrate and focus the light that reaches the leaf exactly upon the cells in the leaf which, by the aid of light, feed on the carbon dioxide of the air. It seems, in the second place, that the plant's power of seeing, or of knowing the difference between light and darkness, often guides it so that it can turn its leaves at just the angle which will enable them to receive most light. Besides this general power of leaves, it seems that many green plants, if not all, have special points, which have been called *ocelli*, or *little eyes*, that are especially sensitive to light, and are developed for that purpose

WHAT IS LIGHT MADE OF?

Light is a very real and powerful and precious thing—yet it is not a *thing*, as a chair is a thing; and it is quite correct to say that, in a sense, light is made of nothing. It is not a form of matter, it is not made of any elements or any compounds, there are no atoms in it; and it does not attract matter, nor is it attracted by matter. Light was once thought to be made of something—and by the very greatest man who ever studied it. Sir Isaac Newton thought that light must be made of a number of tiny specks of stuff that struck the eye, or bounced off any bright object, as a ball bounces from a wall. But now we know that light is not a *thing* or a number of things at all, but is a *state* of motion, or strain, or vibration, in the ether. If we may say that light is made of anything, then we must say that it is made of the ether—but the ether in a particular state of what we call wave-motion. If light were *material*—if it were made of matter—it would have to obey the law of gravitation, but we can prove that it does not.

IS LIGHT A KIND OF ELECTRICITY?

We know quite certainly now that light is a kind of electricity—or that electricity is a kind of light; on page 1450 of this book it is explained that the word electricity is most un-

fortunately used to mean two quite different things. Here we mean electric waves, like those which pass along a wire in telegraphing or telephoning, or through the air in wireless telegraphy. In all these cases what really travels is a wave in the ether, and light is a wave of the same kind, traveling at the same rate exactly, and subject to the same laws in every way. Only the waves of light are shorter and the number of them that occur in a second is much larger than in the case of the ether. The difference is the same as that between a low note and a high note of sound.

Light, then, is a kind of electricity. The waves of light, of radiant heat, and of electricity, differ from the waves of sound: first, because they travel in the ether, and not in anything material; and, secondly, because they are waves from side to side, and not to and fro in the line of their flight through space.

WHAT IS THE ETHER?

Ether is the chemical name of a sweet-smelling liquid, made of carbon, hydrogen, and oxygen, which, like chloroform, produces a peculiar kind of sleep for surgical operations. But when we speak of *the* ether we mean something utterly different. Of course, we should have two different words for the two things, but we have not. If we understood the ether, we should have the key to almost every puzzle we find in Nature. At present we know very little about it, but we are sure of certain facts. The ether is *everywhere*. We cannot believe that there is any gap or space or crack in it. It cannot be seen, yet we may say that we see nothing else, for light is a state of the ether, and light is the only thing we can see.

The ether has no weight, yet it is the cause of weight, in a sense, for weight is due to gravitation, and it is through the ether that gravitation acts. And we believe that matter is really made of the ether—that "the electric" particles, or electrons, of which the atoms of matter are composed, themselves consist of things in the ether which we can only dimly picture to ourselves as knots or lumps of ether.

Yet, though we do not know how, there is now really no doubt that the ether is the universal mother of all matter, and of all material things; it is the element of elements, and we cannot pierce behind it to anything, but to the Author of all that is.

WHAT MAKES US SEE LIGHTS WHEN WE GET A BLOW ON THE EYE?

This depends on a very wonderful law about the nerves of the senses, that was discovered by a great German called Müller about the middle of last century. It is that special nerves which belong to the various senses, the nerves of hearing, the nerves of smell, the nerves of vision, and so on, are bound to give us a sensation of hearing or smell or vision if they give us anything. As a rule, the particular nerve is only affected by the special thing it is meant for—the eye-nerve by light or the ear-nerve by sound. But if something has the power at all of affecting the nerve, then we shall seem to see or hear, whatever the thing that excites the nerves really is. Thus a blow on the eye may affect the eye-nerve, and if the eye-nerve is affected we are bound to get a sensation of light. The best proof of this great law of Müller is furnished by electricity. We have no special sense for electricity, as we have the ear for sound or the eye for light; but, if properly applied, electricity is capable of affecting, or stimulating, which is the proper word, any nerve in the body. So, with the electric current you may affect the nose, and the person smells; the eye, and he sees; the ear, and he hears; the tongue, and he tastes; the skin, and he has the sense of touch. We now know how to explain this law. It is not that the nerve of the eye is different from the nerve of the ear, but that it goes to a special part of the brain. Each part of the brain that is concerned in the sensation *is specialized*, or made special—that is, it can only do one thing. The different parts are like the notes of a piano, each of which gives out only the sound natural to it, and no other.

HOW DID THE FORESTS THAT TURNED TO COAL COME TO BE BURIED?

The earth that covers the great coal deposits of the earth's crust was laid there through long ages by the sea. Nothing is more certain than that the sea rolled for many ages over every part of what we call the dry land. Probably most parts of the earth's surface have many times been under water and many times above it. The land where coal now is

sank and was covered by the sea. Wherever the sea is, there its water slowly deposits an ever-deepening layer of substances which it has dissolved from the rocks, and other materials which rivers have brought, and yet others which are the remains of creatures living in its depths.

Then, as the waters roll elsewhere, and the bottom of the sea is uncovered, the surface of these deposits becomes the surface of the dry land. If we study the rate at which the waters are forming deposits to-day, we can get some idea of the time that has passed since various layers of the earth's crust were on the surface, as every layer of it has at some time been; and so we can see that many millions of years have elapsed since the coal measures were alive.

ARE WE CREATING NEW DISEASES?

I believe that the answer to this most important question is "No." It is not easy to answer, because we know really very little about the diseases our ancestors died of; but the more we learn by reading the old authors, by studying skeletons and mummies, and so on, the more certain are we that our ancestors suffered from our diseases, and even from other diseases that we have not.

Our cities, with their terrible overcrowding, may mean that diseases spread very easily, but these diseases are not new ones. Dirt makes disease, but our ancestors were ever so much dirtier than we are. They had no such supplies of pure water as our towns have; they drank very impure water, they had no drainage, and they lived in perpetual smells. We find proof that the diseases which are most deadly to-day, like tuberculosis, were well known and terribly common 2,000 and even 5,000 years ago. If we create any new diseases, they can only be diseases of the mind, due to the foolish and unnatural lives that many of us live; but doubtless, when any of our ancestors lived these foolish lives, they suffered as we do.

DO DISEASES EVER DISAPPEAR?

Yes, indeed they do, and it is a good thing, too. There was a time when England was cursed with a very terrible disease which has its real home in China, and is called the plague. There is now no plague in England, though it would soon come back if a careful watch were not kept for it at every port, and if every case that reaches London or Liverpool or Glasgow were not at once kept apart, so that the plague does not spread. There was once leprosy in England, and the poor lepers were imprisoned in great places. There is now no leprosy in England, and has not been for many years, except a few persons who have got it abroad, and returned to live in England. Smallpox, too, has almost disappeared in England, it is little known in this country, and in Germany it is practically unknown, for in Germany the discovery of vaccination by the Englishman Jenner is appreciated by the nation and is employed generally.

Yellow fever and malaria have disappeared from places where they had raged for ages, because the insects that carried them have all been killed. Not very long ago a terrible disease, called Malta fever, was made almost to disappear from Malta, as it was learned that it is carried in goat's milk. No soldier or sailor in Malta is allowed to drink goat's milk, and so they do not suffer from the disease.

ARE WE HEALTHIER THAN OUR ANCESTORS?

Certainly we are—far healthier. The death-rate has been falling all over the United States for many years. We know at what ages our ancestors commonly died—even those who had most wealth and knowledge. We know that, long ago, the children of the kings and queens died at much the same rate as the children of the slums do nowadays. We know hideous diseases which raged in America and are now unknown, or very rare. Only a generation ago, for instance, typhus was very common, and now it hardly causes ten deaths in the whole of America in a year, though the disease is still sadly common in some very poor countries.

Nothing is more foolish or stupid than to talk of the "good old days," as if everyone had been happy, and wise, and strong, long ago. The more we learn of the "good old days," the more we learn how bad they were, and how much better off we are now; though our children's children will think we were bad enough, when they have abolished tuberculosis and other terrible diseases which we

could abolish at any time if only we were wise enough.

WHAT CAUSES TUBERCULOSIS?

Tuberculosis is caused by a microbe, which was discovered in Germany near the end of the last century. We catch it from each other, and from the milk—and occasionally the flesh—of cows, which suffer from it just as we do if they are kept in badly ventilated places. The disease is now diminishing in America, England, France, and Germany, and will go on diminishing the more we act on our knowledge of its cause. They do this best in Germany, and it is decreasing much more rapidly there than it is here. We have begun here to protect ourselves from the milk of tubercular cows, to punish people for spitting in trains and street cars, and to learn to keep our bedroom windows open, and when you who are children, and who read this now, have grown up to be men and women, tuberculosis will probably be as rare as typhus is to-day.

The children of to-day will be the grown-up people who govern America and vote for members of Congress in a few years to come; and the next generation will learn that the health of the people is the best possession of a nation, and will know how to obtain it. The children of to-day, and even more their children, will look back on us, who allowed ourselves to be killed by tuberculosis at the rate of about one in seven of all deaths—and they will not talk of the "good old days."

WHY DOES RED IRRITATE A BULL?

It is very difficult to be quite sure of the truth of this question, and we ought really to be sure of the fact before we try to explain it. No one has made experiments to prove that red really irritates the bull more than any other bright color. Still, it is probable that red, perhaps just because it is usually the brightest of colors, does irritate a bull; though if the red color were on something that did not move, perhaps it would have much less effect. People have thought that bulls are irritated by red because it is the color of blood; but I do not think that is so. A certain amount of study of human beings seems to suggest that different colors differ in their effect on the nervous system, and that while such colors as green and violet are soothing, yellow and red are exciting. Of course, it takes very little to irritate a bull, and a red rag is by no means necessary; only the saying is so popular, perhaps because it applies so well to ourselves. We are all apt to fire up at some particular subject, as the bull is supposed to do at a red rag.

DOES THIS EARTH LOOK LIKE A STAR TO OTHER PLANETS?

Our earth must be a very brilliant object in the sky. Seen from the distance of the moon, it would be magnificent, though, like the moon, shining entirely by borrowed light. To an inhabitant of Mars, if he exists, the earth will probably look much brighter and larger than Mars looks to us, since the earth is much larger than Mars, and much nearer the sun, so that it is proportionately brighter, according to the "law of inverse squares," explained on page 2536. But there is a very striking fact about the earth, as it must appear to all the planets, from Mars outwards, that are farther than we are from the sun. As the earth lies between them and the sun, the portion of the earth's surface that they can see illuminated must change, and be always changing; for exactly the same reason as we notice in the case of the moon. When the earth is just between Mars and the sun, she must be invisible from Mars, because the shining side of her is turned away from Mars. This must also be true of the appearance of the earth as seen from any planet still farther than Mars. To the other planets the earth will be recognized as a planet, and not a star—if they have inhabitants who possess intelligence—because she will be seen to wander through the sky, as the other planets, or wanderers, are seen to do from the earth.

WHY IS VENUS BRIGHTER AT SOME TIMES THAN AT OTHERS?

The principal answer to this question can be guessed by anyone who has read the answer to the last question. Venus is nearer to the sun than we are, and therefore Venus must have phases like the moon—times when she is full, times when she appears as a crescent, and so on. That this is so was one of the many wonderful discoveries made by Galileo, when he perfected his telescope. I wonder what lovers of Nature would give

A WHEEL A QUARTER OF A MILE ROUND



Some of you have seen this gigantic wheel which used to be at Earl's Court in London. This was not the first great wheel to be built. An American engineer, Mr. G. W. Ferris, had seen those curious little upright roundabouts that come to the country fairs, and he thought out the idea and built for the World's Fair at Chicago a big wheel of iron that carried 1,440 people at one time. Then the Earl's Court wheel was built, and this was much more wonderful than the other. It was 300 feet across, and the towers that supported it were 175 feet high. The axle, weighing 54 tons, was hollow, and people could walk through it from one side to the other while the wheel was going round with its 1,600 passengers. The great wheel was turned by a big engine that needed only one man to work it.

nowadays for a new instrument of such power as the telescope has, and the first chance of using it! Galileo had scarcely to do more than put his "spyglass" to his eye, in order to discover the spots on the sun, the craters of the moon, four of the moons of Jupiter, the phases of Venus, and the rings of Saturn! He did not dare to announce his discovery about Venus in an open way; but, of course, he wished to place the fact on record, so he wrote an acrostic, in which was hidden the statement that Venus has phases like the moon. It needs only a quite small glass, such as Galileo's was, to see the disk of Venus, and so to find that it changes just as the moon does—though, naturally, at a very different rate. I am writing in September, and just now the illuminated portion of Venus is between four-tenths and five-tenths of its disk, so it is nearly "half-Venus."

Of course, all the other planets, except Mercury, are always seen by us on their lit side, as they are farther away from the sun than we are. Mercury is so small and difficult to see, owing to its nearness to the sun, that it would be very difficult indeed to make out its phases.

WHAT IS THE DIFFERENCE BETWEEN FAT AND OIL?

Oil is a misleading word, for it is used in two senses. We call the things that give plants their smell, such as turpentine, oils, but they are quite different from other oils, and we should always call them *volatile oils*, which means flying oils, because they readily fly into the air in the form of a gas. If you put a drop of such an oil on a piece of paper, it soon disappears; but if you put a drop of any of the other kind of oils, such as melted butter, on a piece of paper, it makes a mark which stays. So these oils are called *fixed oils*, and the simple thing to remember is that fixed oils and fats are really the same thing. When it is solid we call it fat; when liquid, we call it oil. A fixed oil is melted fat, and fat is a fixed oil that has turned solid. Every fat has a melting-point, as we call it, when it is so warm that it melts and turns into oil; or we might say that every fixed oil has a freezing-point, when it is so cool that it solidifies and turns into fat.

Now, it is a very interesting thing about the fat of our bodies that its melting-point is just the temperature of the blood. So the fat of our bodies is always just at a point where it is neither quite solid nor quite liquid; and this is just the state of it that suits us best. If it were quite solid, then the blood could not easily help itself to it as it was needed; and if it were quite liquid, it would not stay in one place. There are hundreds of different fats and oils and mixtures of them, and they all have their own particular melting-point, above which they are liquid oils, and below which they are solid fats.

WHAT DO WE MEAN BY TRADITION?

When knowledge of any kind is handed down from father to son, we say that it is tradition, which really means *giving across*. Tradition may be given across by word of mouth, or, in later stages of civilization, by books.

It is one of the most unfortunate things in the history of the world that tradition so very often gets lost, as in the case of the Pyramids, for instance. Probably tradition is quite safe so long as a particular civilization persists, but it is always seriously endangered when one nation is conquered by another. For one thing, books and inscribed stones and walls are destroyed by the soldiers when cities are captured, and so all the traditional knowledge which they contain is lost to the world.

HOW IS IT THAT KNOWLEDGE CAN EVER DIE OUT?

As for tradition from parents to children, when a nation is conquered, many parents are killed, and children are carried off to other places, or, at any rate, are separated from their parents. In olden times almost every grown man of a conquered nation was either killed or enslaved, and so lost his children, and his traditional knowledge died with him. This may have happened in the case of the Pyramids, and it is quite possible that full accounts of how they were built were contained in the great library of Alexandria, and were lost when that library was burned. The really wonderful thing about our knowledge of olden times is how learned men manage to find out about the remote past by digging up and interpreting bits of inscriptions on stone in languages to which, at first, no one can find the key.

THE NEXT QUESTIONS BEGIN ON PAGE 2907.



The six Morris dancers in costume performing the "Ring" figure in the Bean Setting Dance

HOW TO DANCE THE MORRIS DANCES

CONTINUED FROM 2726

THE quaint old English Morris Dances, though of Moorish origin and taken into England in the Middle Ages, perhaps from Spain by John of Gaunt, became very popular in that country. The country folk altered them to suit their own ideas of a dance for holidays and feast days, so that from the time of Queen Elizabeth no festival was complete without the merrie Morris men. Just when the dances were in danger of being forgotten, new interest in them arose, and now they are much practised in gymnastic and dancing classes. The old tunes which go with them have also been preserved and adapted to the modern piano. They are in various times, and the step also changes in height and length.

And first, how do the dancers dress, and what do they need? The old Morris men wore very fantastic garments, but girls and boys who dance now can hardly do better than wear the simple rustic ones shown in the pictures—the boys, or girls taking the boys' parts, holland smocks and hats; the girls, cotton frocks and sun-bonnets. All of them wear elastic bands round the leg, on to which four or more bells are sewn. These can be bought at 10 cents a dozen. Ribbons may be worn, but the bells are essential to all the dances, and one object of taking the jump is to rattle the bells.

Then sticks will be wanted for some of the dances, plain round wooden sticks about eighteen inches in length. They can be bought in bundles, or made at home from curtain-rollers or sticks for tying up flowers. Each dancer will want two handkerchiefs.

The Morris Dances have a special step and a peculiar jump; one or the other, the step or the jump, is going on throughout the dance. The jump is taken with the body held straight and then raised by springing suddenly with both feet off the ground. The feet land on the ball of the foot, the toes touching before the heels, so that the spine is not jarred. The step is easily imitated when once seen, and the music almost suggests it. In Bean Setting you raise the right foot as you do in taking a walking step, and move it forward so that the heel is about as advanced as a foot length from the toes of the left foot. Then hop twice on the left foot, and repeat the step with the right foot.

One form of the step used in the Laudnum Bunches bears a likeness to the polka step, only danced with stiff knees, hopping on right, on left, on right, and on right again, with left extended in front.

In the high step which belongs to the Capers movement described later on, the toes of the lifted foot are as high as the knee of the other leg. The step matches the music so well that it is difficult not to keep time.

The names of the Morris Dances are as quaint as themselves, and suggest their country origin. The best known are probably Bean Setting, Laudnum Bunches, Rigs o' Marlow, The Old Woman Tossed Up in a Blanket, Constant Billy, Shepherd's Hay or Hey, Bluff King Hal, Trunkles, Blue-Eyed Stranger, Country Gardens, The Cuckoo's Nest, and Princess Royal.

Thoroughly characteristic are the first two of these, which are here described in detail. In these dances six dancers form a set, and start in two files with faces towards the music, No. 1 dancer nearest to it, like this:

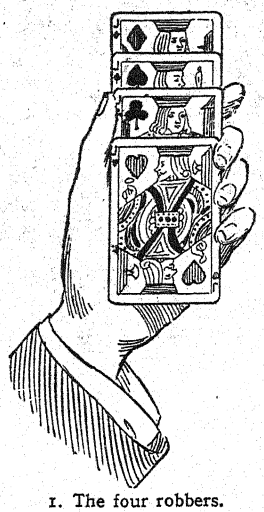
Dancer No. 5 partner with dancer No. 6.
Dancer No. 3 partner with dancer No. 4.
Dancer No. 1 partner with dancer No. 2.

SEE PAGES 3322 AND 3323.

THE ROBBERS AND THE SOLDIERS

THIS card trick is very simple, but rather mystifying. It requires no expert ability to perform, hence it is one that is very suitable for young conjurers.

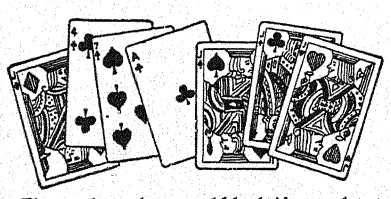
The conjurer has a pack of cards, and he takes out the four knaves, which he holds up to the company in the manner shown in picture 1. Then he tells the company his story. "Once upon a time," he says, "there were four robbers in Spain, and their robberies had caused them to be pursued by a band of Spanish soldiers. These four knaves are the four robbers. As they fled they came to a ruined castle, and the pack of cards here is the castle. The robbers entered the castle"—here the conjurer lays the cards in his hands, face downwards, upon the rest of the pack—"and held a council. They decided that one of their number should keep watch."



1. The four robbers.

At this point he lifts the top card and throws it, face upwards, upon the table, then resuming: "That is the robber who kept watch, and the other three went down to the dungeon to sleep."

Here he takes the three cards on the top of the pack one by one, and, without allowing their faces to be seen, he puts them at the bottom of the pack. He keeps up his story as he does so: "These are the three robbers who went down to sleep, and it was agreed that, if the watching robber saw the soldiers approach, he should at once call the others. Shortly after midnight, the robber who was keeping watch saw, where the moonlight shone through the trees, that a company of soldiers was approaching. He immediately called to the others: '*Come up, come up, come up!*'"—here the conjurer flips the edges of the pack with one hand—"and immediately the robbers all sprang to their feet."



2. The cards as they would look if spread out.

At this point he takes the three top cards in the pack and throws them, face upwards, on the table. They are the other three knaves, which the members of the audience are positive that they saw placed at the bottom of the pack. How did they get to the top? That is what the audience cannot understand, and what you want to know in order to be able to perform the trick.

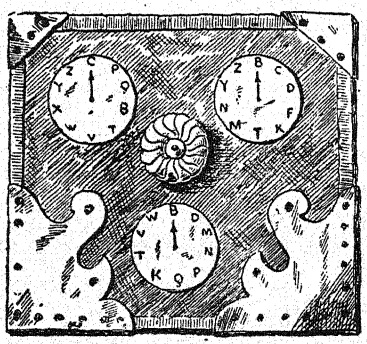
The explanation is very simple. The three knaves were not put at the bottom of the pack at all, although they seemed to be. The conjurer had seven cards in his hand, not four. Between the first knave and the second knave were three other cards—any three—from the pack, but they were placed so that they could not be seen by the spectators.

If the conjurer had spread out the cards, which, of course, he would not do, as it would have exposed the trick, they would have been like picture 2. Thus the three cards that were put at the bottom of the pack were the three hidden cards, not the knaves at all, and the knaves remained at the top of the pack, ready to be exposed as soon as the watching robber called: "Come up, come up, come up!"

This is a good trick, but it should not be performed too often in front of the same audience or it is very apt to be found out.

THE PUZZLE OF THE SECRET LOCK

ONCE upon a time there lived a very rich man who possessed a great number of very valuable vessels, made of silver and gold. From time to time, however, thieves succeeded in entering his mansion and carrying off some of these precious vessels. He therefore decided that he must have them locked up more carefully than before. Accordingly he gave instructions for a very strong safe to be made, and arranged that it should have a secret lock. On the outside of the lock were placed three dials, each with a pointer and ten letters on it. Before anyone could turn the handle which opened the door of the safe, he had to turn round each pointer to a certain letter, a different one on each dial. We see what the lock looked like and what letters were placed on each face in the picture, which is reproduced from Mr. Dudeney's "Canterbury Puzzles." Now, any thief who was endeavoring to turn the handle of the safe would, unless he were very fortunate indeed, take a very long time before he attained this object, because he might have to go through 999 combinations of letters before finding the right three. The rich man told the three letters to his two most trusted servants, and, in order that they might remember them the more easily, the three letters which he had selected formed a word. How many of us are able to discover what the word was?

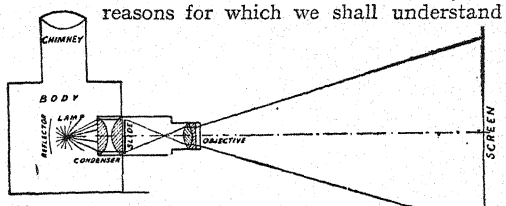


HOW TO MAKE A MAGIC LANTERN

IT is well to mention at once that scientific people do not use the term magic lantern now, but prefer the term *optical* lantern. The prefix *magic* arose in an age when scientific men were regarded as magicians, or dealers in the black art, because their researches and methods were not understood by ordinary people. There is no magic or mystery in the lantern, but it is simply an instrument of scientific value, as well as amusement, in which the laws of optics are utilized to enlarge greatly the image of an object on the slide, and to make it appear on a screen.

There is much difference between the construction of a high-class instrument of science and the little lantern which is described here, but the principle is identical in both. The elements of any lantern are, as indicated in picture 1, the *body* or casing; the *condenser*, which receives light from the *lamp*, or other source of illumination, and transmits it through the *slide*; and finally the *objective* or magnifying glass, which focuses the light received from the condenser through the slide, and transmits it to the *screen*.

A single lantern can be made in several different ways, as well as in different sizes. A very elementary form of magic lantern might be made from an old tin cracker-box, with a cheap wall-back lamp and a simple lens, and a slide-carrier made from the wood of a cigar-box. But we are going to make something much more like a perfected scientific instrument, even if it entail the expenditure of a dollar or more. We shall adopt the old-fashioned oil-lamp to furnish the necessary light. It is not so bright as oxy-hydrogen lime-light, acetylene, or electricity, and it is very hot, but good results are obtained with a suitable lamp, well tended, and nearly all the smaller simple lanterns are illuminated in this way.

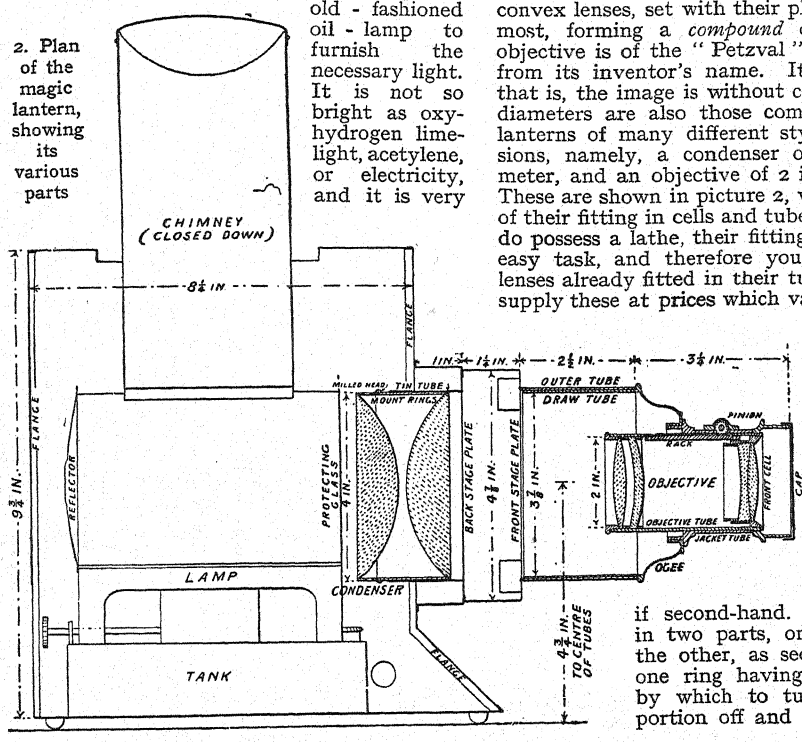


1. The principle of the magic lantern

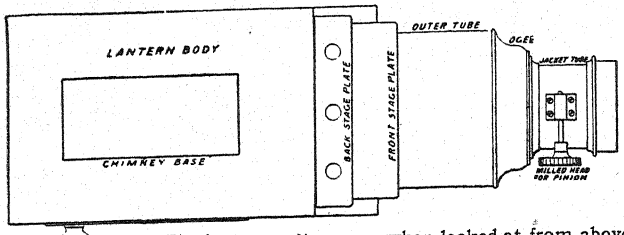
In settling the size of the lantern, the cost of fittings must be considered, because what are termed the *optical parts* must be purchased, as you cannot make your own condenser and objective, nor can you make very easily the tubes in which they are mounted.

The most important part of the lantern is the optical. On this depends the clearness of the picture thrown on the screen. Many of the cheapest lanterns have simple lenses, but they do not give bright, clear definitions free from color rings. To ensure good results, lenses must be combined in certain fashions, the reasons for which we shall understand some day when we study the laws which govern the refraction of light. There are many such combinations. Those which we select for this lantern are shown in picture 2, and are the ones which are most generally used. The condenser is composed of two plano-convex lenses, set with their plane faces outermost, forming a *compound* condenser. The objective is of the "Petzval" form, so called from its inventor's name. It is achromatic, that is, the image is without color rings. The diameters are also those commonly used for lanterns of many different styles and dimensions, namely, a condenser of 4 inches diameter, and an objective of 2 inches diameter. These are shown in picture 2, with the method of their fitting in cells and tubes. Even if you do possess a lathe, their fitting is not at all an easy task, and therefore you must buy the lenses already fitted in their tubes. Opticians supply these at prices which vary according to quality. Their names and fittings are as follows:

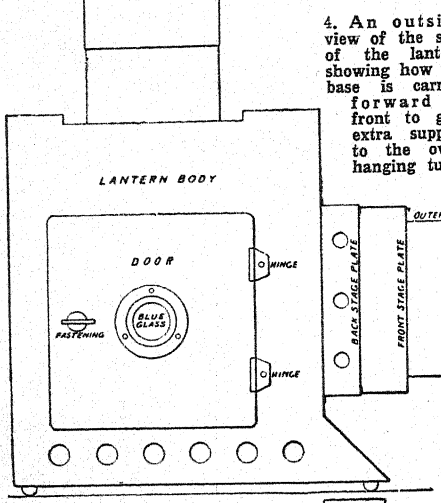
2. Plan of the magic lantern, showing its various parts

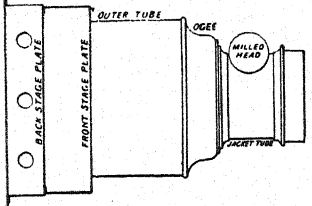


A 4-inch condenser, of compound plano-convex type, may be purchased ready in its *mount* or *cell* for 2 dollars new, and less if second-hand. The mount is in two parts, one screwed over the other, as seen in picture 2, one ring having a milled head by which to turn the screwed portion off and on. A few air-



3. The lantern as it appears when looked at from above





4. An outside view of the side of the lantern showing how the base is carried forward in front to give extra support to the overhanging tubes

holes are made, to prevent mist from forming. The back lens is liable to become cracked by the heat of the lamp. For this reason the lenses are fitted loosely in their mounts, so that they will rattle, and the hinder one is often protected with a disk of plain glass, as shown in the picture.

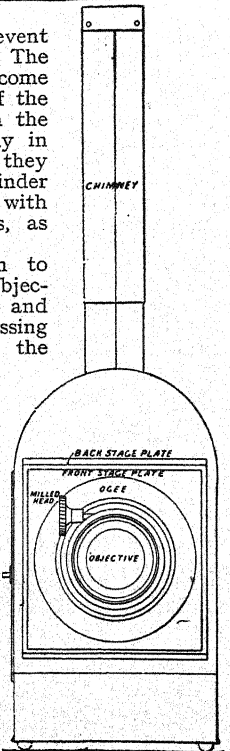
In essential relation to the condenser is the objective, which receives and transmits the light passing through the image to the screen. This is shown in picture 2, and comprizes two distinct sets of lenses in a tube, which is slid by means of a rack and pinion in an outer or jacket tube —as also shown in picture 3—which has a connection to the condenser tube. The front combination comprizes a double convex lens of crown glass—the front one in the picture—and a nearly plano-concave —actually a double-concave—lens of flint glass cemented to it with Canada balsam, the hinder one in the picture. This is mounted in a little cell—the front cell—distinct from the main objective tube, and screwed into the latter, to permit of cleaning the inner faces of both front and back lenses. At the back there is a concavo-convex lens of flint glass, separated by a small space from a double-convex lens of crown glass. These are both secured in the rear end of the objective tube as shown.

The front of the objective is often fitted with a hinged cover termed a *flasher*, which shuts off the image from the screen. In this one a cap is fitted to the front tube, like that used on some cameras.

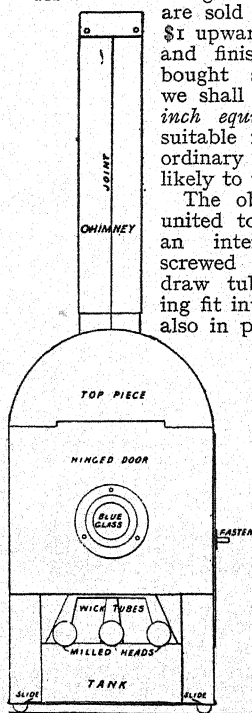
An objective of this kind can be purchased ready mounted in a polished brass objective tube, which slides in another brass tube termed the *jacket*, with a rack and pinion for effecting the adjustment. This is essential for exact focusing. Such mounted objectives are sold at prices ranging from $1 upwards, according to quality and finish. They can also be bought second-hand. The one we shall choose should be of 6-*inch equivalent focus*, which is suitable for lantern work in an ordinary room such as we are likely to use.

The objective combination is united to a *draw tube*, through an intermediate *ogee*, being screwed into the latter. The draw tube is inserted, a sliding fit into an *outer tube*, as seen also in picture 3, which permits the lenses to be readily taken out of the lantern when not in use. The outer tube is fitted with an internal flange, and soldered to the *front stage plate* or slide-carrier plate.

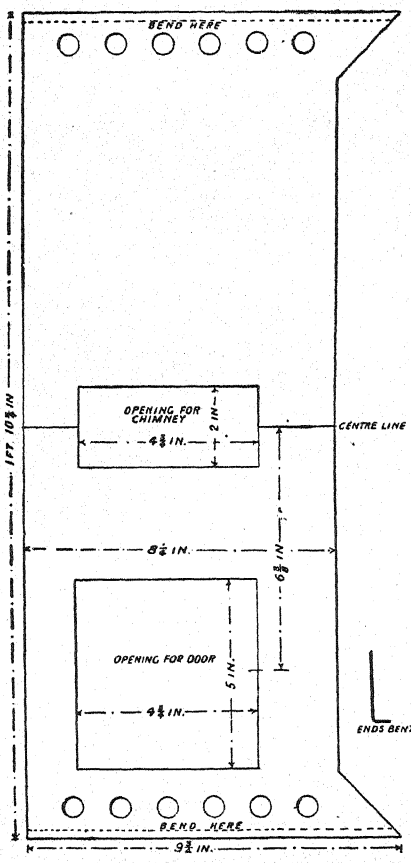
Between the condenser and the objective the picture slides have to be placed, and sundry plates have to be fitted to effect these connections. Behind the condenser is the lamp. These connections and details will be better



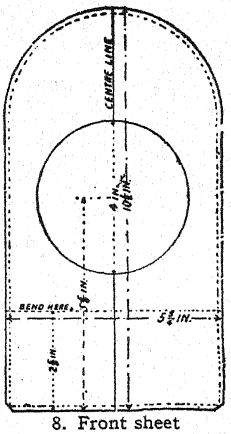
5. Front view of lantern



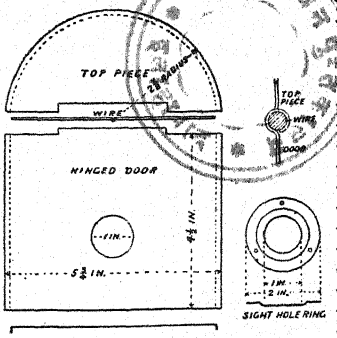
6. Back view of lantern



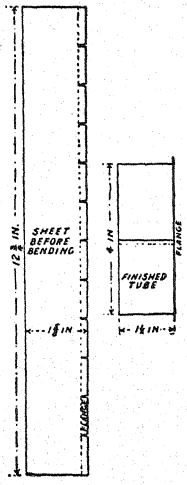
7. Sheet prepared for bending



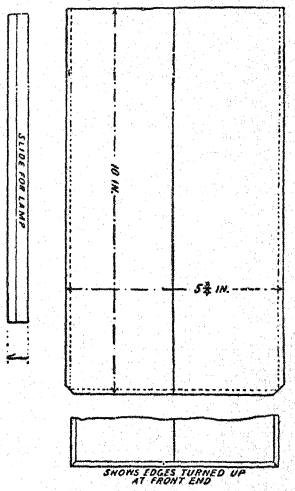
8. Front sheet



9. The parts for back of lantern



11. Tube for condenser

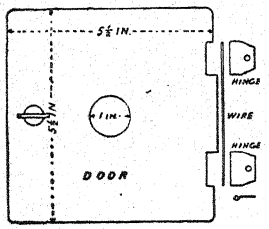


10. Bottom of lantern

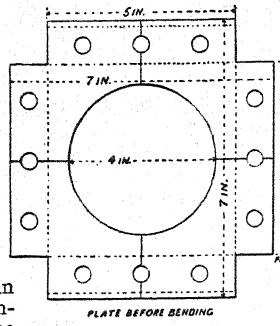
studied after the body of the lantern has been made, which work we shall now take up. In the view given in picture 2, the lantern is supposed to have been cut down vertically through the centre. In picture 3 we are looking down on the outside of the lantern from above. In picture 4 we see the lantern from the side, in picture 5 from the front, and in picture 6 from the back. The base is carried forward at the front, as shown in pictures 2 and 4, to give extra support to the overhanging tubes.

The best lantern bodies are made of mahogany, lined with sheet iron, leaving an air-space of a quarter of an inch or so between the iron and the wood. We must make something simpler, as shown in the pictures. The body may be built either of sheet iron or of tin. Russian sheet iron is better than the ordinary quality. If tin is used it must be japanned black, but this can be done after it is made into shape. The tin can be cut with a strong pair of scissors, but if you can borrow a pair of shears from a friendly tin-smith the work will be rather easier. It is worked very readily, and you should meet with little difficulty in this part of the task. The lantern body, too, is designed as simply as possible, comprizing only four distinct pieces of tin in the main portion. The sides and top are in one sheet, shown in picture 7; the ends are in two pieces, shown in pictures 8 and 9; and the bottom is in one piece, shown in picture 10.

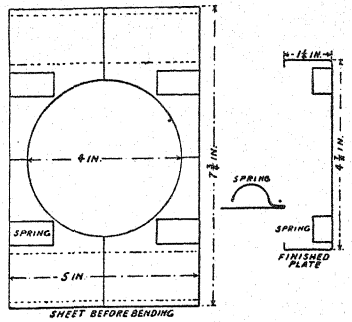
The sheet for the sides and top is made in one, to avoid jointing the top. It is cut to the dimensions given in picture 7, including an opening for the chimney, an opening for the door at the side, and six half-inch round holes are cut at both ends to afford draught for the lamp. When marking this out, start from the *centre line*, cutting each half on each side of this line exactly alike, with the exception of the door-opening. As you will not cut the edges exactly correct with scissors or shears, a file will have to be used to produce accurate results. Also, the back edge must be finished smoothly, as you might not be able to manage a beaded edge well, which is done in shop lanterns. The sheet must be bent to a semicircle at the centre, as shown in pictures 5 and 6. The easiest way to do this is to plane a block of wood to the curve, and bend the sheet round that until it fits the curve exactly. Or you might find a piece of pipe of about the right curve. The extreme ends must be hammered and bent sharply over the edge of a block



12. The side door



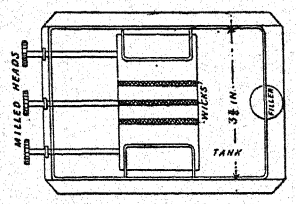
13. The back stage plate

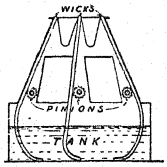


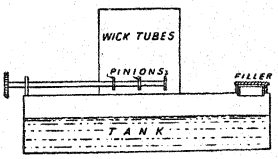
14. The front stage plate

of iron or wood, as seen in pictures 5 and 6, and enlarged in picture 7, the object of which will be explained presently. The front end sheet, shown in picture 8, is made to the dimensions given, and has one hole cut in it to receive a *tin tube*, as shown in picture 2, in which the condenser-cell or mount is inserted. This sheet must have its edges, except the bottom edge, bent round from the dotted lines, as shown, to form a little flange to give sufficient breadth of surface to be soldered to the sheet, which has been cut and bent from picture 7. You can just see this flange in picture 2. This can be bent with a pair of pliers, but slits will have to be snipped at intervals of about one inch round the curved portion at the top. The flange can also be bent by hammering it round the edge of a block of wood curved to the radius of the top. Bending at the bottom must be done to correspond with pictures 2 and 7.

The back end piece, as shown in picture 9, comprizes a semicircular piece at the top and a hinged door, seen also in picture 6. The first is flanged similarly to the front sheet, picture 8, and soldered to the top of the lantern. But a hinge has to be made in it, and the door fitted, before the soldering is done. Both pieces are notched, as shown in the picture, and turned over a piece of wire. An enlarged detail of this is seen to the right of picture 9. This bending over is done with pliers, and finished neatly with light blows from a hammer. The

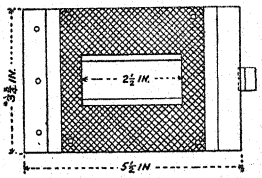






15. The tank with wick for lamp

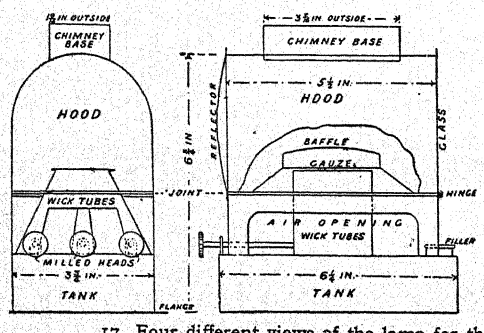
edges of the door are bent backwards towards the lantern body, seen below, to embrace the sides of the latter. A hole is cut to receive a disk of blue glass, used only if limelight is employed. The glass is held in by a ring riveted over it to the door seen to the right.



16. Bottom of hood with gauze

Picture 10 shows the bottom or floor of the lantern. It is turned up and round at the sides and front to embrace the sides and front of the body, as shown in pictures 2 and 6. The bending over is done with pliers, and may be finished by hammering, making a neat job without solder. Bent edges are seen at the bottom of picture 10. Knobs are soldered on the bottom to keep the lantern up off its support. The heads of large brass-headed nails will do for these, which are shown in pictures 2, 4, and 6. Two strips are soldered along the bottom inside, within which the foot of the lamp slides along, as seen in picture 6.

The door is fitted at one side, with a disk of blue glass in the centre, as seen in picture 4. The hinges are made separately and fitted to the door, and then soldered to the body, as in pictures 12 and 4. The glass disk is fitted as in picture 9. A fastening is made of a bit of brass, filed to the shape shown, and riveted to a pin which passes through the door and has a button on the outside to turn it by. A shop-made door is beaded, but beading may be



17. Four different views of the lamp for the magic lantern

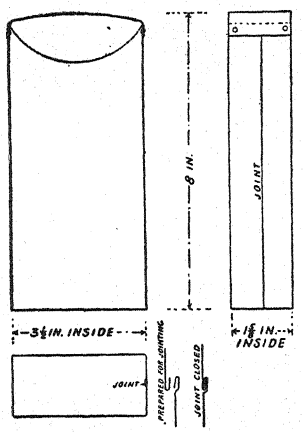
omitted if the door is made of rather stout material.

We shall now take up the connection between the lantern body and the optical tubes. This comprizes, as you will see in pictures 2 and 4, a back stage plate, a tin tube, and a front stage plate, all of which you will find shown in detail in pictures 13, 11, and 14 respectively.

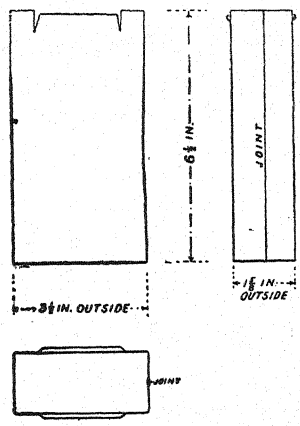
The *back stage plate*, as shown in picture 13, is made of a square sheet of tin, notched and cut at the four corners, and bent round square, the cut corners meeting. Three air-holes are also cut in each side, and the sides which are to form the top and bottom are bent round to form flanges, which are soldered to the front, as in pictures 2, 4, and 5. A little solder may be run into the corner joints.

Before the plate is soldered into place, the *tin tube*, shown in picture 11, is made by bending a flange on one edge of a strip of tin, snipping it at intervals with a pair of scissors, and bending it to form a circle, soldering the joint. The flange is then soldered to the inner face of the stage plate, and the tube passes within the hole in the front plate of the lantern, as seen in picture 2. The *mount rings*, or cell, of the condenser lenses fit within the tube, sliding easily therein. The *front stage plate* is made as in picture 14. A piece of plate, cut to the dimensions given, is bent round at two ends, and at each of these ends a narrow flange is bent for soldering to the back stage plate. A hole is cut through to receive the *outer tube*, which has a narrow flange provided to be soldered to the plate, as seen also in picture 2. Four brass springs are made, and soldered by one end only, at top and bottom within the plate. These are a substitute for the more troublesome springs and pins which are fitted to shop lanterns. They yield a little on the insertion of a slide, and so accommodate their pressure to various kinds of slides which have different thicknesses. We come next to the lamp and chimney, seen in position in picture 2, and separately in pictures 15 to 19. Nearly the whole of the lamp is united by solder, and the chimney by means of joints without solder, which would become melted in the intense heat. These lamps can be purchased at a wonderfully small cost, complete with a chimney ready for use, but we describe and illustrate one for those who have plenty of time at their disposal and like to make things for themselves.

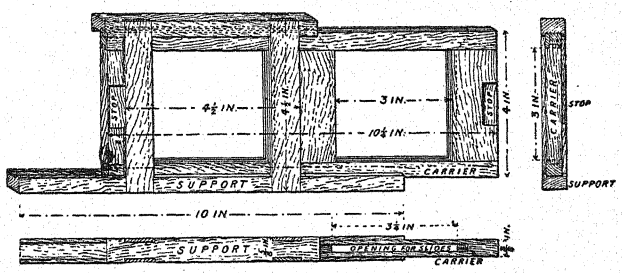
The lamp contains three wicks, each in a separate tube, for burning paraffin which is contained in the *tank* or reservoir at the bottom, poured in through a brass *filler* screwed at one end. The flanged edges of the tank slide along the ways soldered in tne bottom of the body as in picture 6. The wicks are adjusted with the milled heads, each turning a toothed wheel beside its wick. The wicks approach at the top to give one broad flame. Air enters the openings provided at the sides and ends. The smoke is consumed in hot wire gauze and baffles, within the hood above. The hood is hinged, to throw back, to permit of trimming the wicks. When closed it rests on a light framework of wire soldered to the top of the tank. At one end of the hood there is a concave polished tin reflector to throw the light on to the condenser. At the other end a sheet of plain glass protects the condenser from excess of heat. Above there is a rectangular frame soldered on, over which the lower end of the chimney fits. The hood must be of blackened sheet, but the oil-tank is of common bright tin-plate. The method of union of the parts is shown in the pictures.



18. Outer casing of chimney



19. Inner casing of chimney



20. The double carrier for the lantern slides

The chimney, shown in pictures 18 and 19, is made in two pieces, with a *telescopic draw*. The two parts slide freely over each other. But to ensure that they shall remain as drawn out, at one end a breadth of the iron is snipped and pulled outwards to afford by its springiness a certain amount of friction. Picture 20 shows the slide-carrier, which can easily be made of wood from this design.

WHAT ANIMALS ARE THESE?

THE FIRESIDE GAME OF "WHAT-IS-ITS-NAME?"

WE have given many questions which we can read out to our friends for them to answer on pages 2362, 2523, and 2588. Here are some more puzzle questions, which deal with some of the animals that are described in the Nature section of this book. The answers are to be found on page 2875.

THE LITTLE CREATURE THAT IS MORE CLEVER THAN MAN

1. In our garden there is a beautifully-made little creature which can do things no human being can do. It makes out of its own body a rope strong enough for it to walk on, yet so fine and straight that it is used in making the most delicate optical instruments. So thin is it that one hundred of its strands make only the thickness of a hair; so strong, that it serves as a net to entrap prey, and can withstand rain, wind, frost, and heat. See, here is one of our little friends up in the attic. It has four pair of legs, a body in two pieces, and eight little eyes, so no wonder it can see all about it. What do you think it is named?

THE ARMOR-PLATED OLD MAN OF THE GARDEN

2. We find a very different animal hidden away under the lettuces. He has had one hundred and fifty birthdays and may have many more yet, for he takes life easily. He always carries his house with him. It is made of hard bony plates and a flat breastplate underneath, leaving a space in front for his head and two legs to peep out, and another at the back for his two short hind legs. If you hurt his feelings he draws back his head within his house. Let us tempt him with a nice juicy bit of lettuce. There, his slow, dull little eyes see it; he takes a bite and the piece is gone; but he may not eat again for weeks, and he goes to sleep all the winter in as cosy a corner as he can find. When he does move about he goes very slowly indeed, and many a more tiny creature could easily race him. He has a cousin who lives in a river, and another who basks on the sea-coast and who may one day be made into soup for dinner. When he himself dies his bony armor will be made into little boxes, and combs, and purses. What do we call him?

THE MOST AWKWARD ANIMAL ON THE EARTH

3. In the forests of Africa is an animal which in the course of ages has changed to suit its home. It liked to eat the leaves on the tall acacia, so it grew a long neck to reach them. Thorns of prickly plants, the leaves of which it wanted, pierced its lip, so it grew a hard skin to keep it from pricks. To protect its nose from thorns and sand blown by the wind, it learned to close its nostrils tightly. To get away from animals that attacked it, rather than fight, it lengthened its legs, so that it could outrun other animals. It is usually gentle, but sometimes gets angry and bellows. Its coat is covered with large spots. Each of the four feet has two toes, and the strong hoofs are used in fighting. Being so tall, it finds drinking very awkward, and has to straddle its legs almost like the legs of a camera. How should we like to stoop nineteen feet to drink out of a pond? Fortunately it rarely gets thirsty. What is the name of the animal?

THE JELLY THAT WRAPS ITSELF ROUND THE FOOD IT EATS

4. Living in a drop of water is a curious little creature, so simple that it is a mere speck of jelly. It has no real limbs, but it puts out "false feet" whenever it likes, and these it wraps round its food—a tiny living plant—without troubling at all about having no mouth. Its jelly-like mass thickens round the outside to form a kind of protecting wall. One peculiar thing this little creature can do is to divide itself into two new ones, each with a little dark part near its centre called the nucleus. So now it need not play about alone, for the two can float away in the water and seek their own adventures. Some of their relatives are dangerous and cause disease, another is kind and kills these when they get into our blood. What is its name?

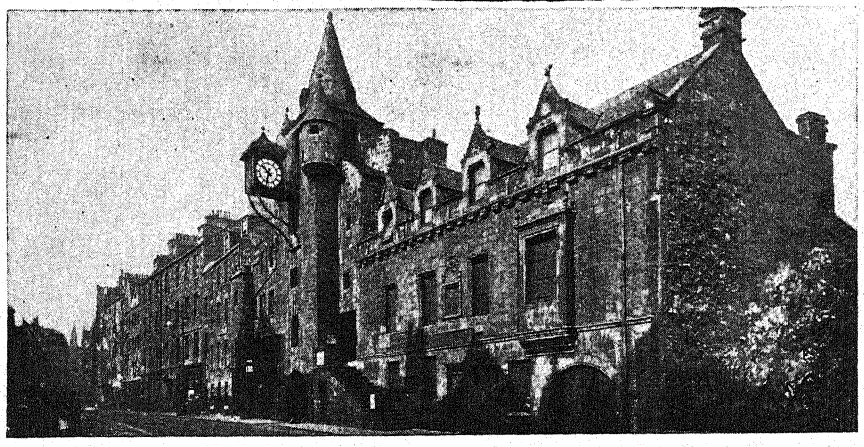
A BIRD THAT IS NO BIRD, OR A BEAST THAT FLIES WITH ITS HANDS

5. To fly with hands! That is what we do in dreams, but there is a curious little animal that really uses its hands as wings, for it has made by the aid of its limbs a kind of parachute with which to fly. It suspends itself to the branch of a tree by hooks at the ends of its thumbs when it wants a rest, or decides to go to sleep during the winter. It likes to flit about in the twilight, and seems as though it would dash its little body against trees and houses. But no, it swerves aside, for though it has small eyes, it has large ears and a delicate sense of touch, so that it knows when danger lies ahead. It is very quick indeed in its movements in the air. It does good in our country by eating insects that are harmful. It is the only mammal that can fly like a bird. Can we tell its name?

THE ROMPING SCHOOL ON THE SURFACE OF THE SEA

6. Out at sea big dark creatures suddenly appear on the surface of the water. See, there is one. And now there are three more, tumbling about and rolling over and over. Look at the white on their under-sides. Now there is a baby one, and the whole family joins in a fine romp. A moment more, and they are all under water, diving for mackerel or herrings. They do not swim close in shore, but if we could see one near, we should find it has a very small ear, one nostril on the top of the head, and many sharp teeth in its jaws. On its back fin are little horny lumps, which remind us of the armor its ancestors used to wear. Its body contains much oil. We may have seen these creatures from a steamer round our American coasts. What are they called?

THE NEXT THINGS TO MAKE AND THINGS TO DO ARE ON PAGE 2869.



A GIRL'S DESPERATE RIDE

CONTINUED FROM 2668

SIR JOHN COCHRANE had been condemned to die, and was shut up in the Tolbooth prison in Edinburgh, seen in the picture. He wished his sons and daughter to refrain from visiting him, for he had joined in Argyle's insurrection against the new king, James II., and thought if his children came to see him they might lay themselves open to suspicion. But one day he had a visit from his daughter Grizel.

Father and daughter felt very sad indeed, for only one glimmer of light could they see. Sir John's father had written an appeal for pardon to the king's confessor, who had great influence over the bigoted monarch. But time was pressing. The journey to London took days to perform, and if the pardon did not come soon, Sir John must die. Even then the warrant must be on its way to Edinburgh.

While discussing the desperate situation, Grizel had an idea which she decided to act upon at once.

Early on the next day she rode south. First, she called at the cottage of her old nurse, borrowed her foster-brother's clothes, and then rode on to meet the messenger. She discovered the inn where he was staying, and entered the room where the man lay asleep, exhausted by his journey. But he was lying on the mail-bag, and she dared not attempt to draw it away. So she quietly took the charges from his pistol, mounted her horse and rode a short distance from the inn, then halted and waited for the messenger.

When the man rode up, she was ready for him. She greeted him pleasantly, and rode alongside and chatted with him. Then, sure of her ground, she quietly told him that she must have his bag. The man at first thought the youth, as she appeared to be, was joking, but he grew angry at her persistence, and when she aimed her pistol at him, fired his at her. But, to his surprize, it of course failed to go off, and his second pistol proved equally useless.

Wild with rage he dismounted and rushed at his assailant, but the girl, quick as lightning, seized his horse and galloped away with it; for was not the precious mail-bag attached to the saddle? Furiously she rode, until she reached a wood, where she opened the bag, took out the warrant, and then galloped off to her old nurse's cottage, changed her clothing, and rode back to Edinburgh.

The non-delivery of the death-warrant caused a delay which allowed time for the king to consider a bribe from Sir John's father. This he accepted, and so Sir John was saved.

AN APRONFUL OF GUNPOWDER

THIS story of Elizabeth Zane is one of those precious tales of the heroism of our great-grandmothers which we cannot forget. Her father was the leading man in his section of the Ohio wilderness and commanded the little fort built for defence against the British and their savage allies. Though there were no great battles after the surrender of Cornwallis in 1781, peace did not come to the West until years afterward.

It was an autumn day in the year 1782. Evening was slowly closing in about the little log fort. It had been attacked by Indians, and the handful of men and women within the palisades watched the descent of the sun with anxious hearts, for, in the deepening shadows of the forest beyond the clearing the enemy was hiding, watching every movement of the besieged, and ready at any moment to rush in and overwhelm them. No one in the little fort knew what deviltry the night might bring forth.

Moreover, a terrible calamity had fallen upon the garrison. They were out of powder. The men, pacing restlessly about the stockade, glanced every now and then from their empty pouches to the little group of women and children that held all most dear to them in the world, and from that out over the stockade to a little hut in the clearing. Then they swore softly to themselves.

Almost under the stockade walls in that little log hut there was an abundant supply of powder, which by some oversight had not been brought inside the fort. Two or three brave men were there, too, to defend the powder, but they were thirty yards away. In every inch of that distance death lurked from the hands of the savages watching in the shadows of the trees.

The men gathered together to talk the situation over. At last one thing was decided. They must have a keg of powder—and at once! Several of the young men eagerly offered to get it; but from the little handful no one could well be spared from his post upon the stockade, and the shadows lengthened as they talked.

Suddenly a girl's crisp, clear voice broke in upon their conference. It was the young daughter of the commander, Elizabeth Zane.

"I have heard you talking," she began decisively, "and I do not think any of your plans are any good. *I* am going for the powder."

A murmur of quick protest broke from the men.

"No," they growled, "it's a man's deed."

"Yes," returned Elizabeth calmly, "but there isn't a man who can be spared. A woman will never be missed in the defence of the fort."

Zane had been regarding his daughter thoughtfully under knit shaggy brows.

"The girl is right," he said at last gruffly in his effort to control his feeling. "Let her go."

Through the gathering shadows Elizabeth stole out of the stockade door. The anxious watchers behind the palisades saw the slim figure dart across the dusky clearing to the hut. For a moment the girl beat upon the door with white, uplifted hands. Then it was opened and she slipped within. Almost by a miracle she had reached the outpost without being discovered by the foe.

It seemed hours—though it could have been but a few minutes—before there were any signs of the door opening. Then it was pushed apart a little way and Elizabeth appeared. She seemed to be holding her checkered apron, full of something, gathered to her breast. Over the stubble field she came on flying feet. Suddenly the men in the fort gripped their useless muskets.

A wild, horrible whoop quivered through the night air. Elizabeth had been discovered. A rain of arrows and bullets flew about the little, running figure, and some shrieking savages broke from the woods in full pursuit.

Once the girl almost fell. Her father hid his face in his hands. Oh! why in God's name had they planted that field with corn in the springtime? No, she is up—her brave, little feet carrying her on—the precious bundle still clasped to her breast. She has almost reached the stockade. Open the door—quick! Strong, swift arms gather her into the fort, and slam the door,—just in time, for a pelting shower of bullets rattle upon the logs.

But who cares about bullets now? The fort is saved—for in that checkered apron gathered in Elizabeth's arms is the gunpowder that will enable them to drive away the enemy and hold the fort until help comes.

IN LAKE MICHIGAN AT MIDNIGHT

THE newspapers often contain accounts of heroic acts. The journals of August, 1906, tell the story of a brave deed by a young fellow of nineteen, one Edwin A. Crolius.

He, with four other young men, were out on a pleasure trip in a small sailing yacht on Lake Michigan. Toward night they were caught in a squall, and, after a brave fight with the wind and waves, their boat was capsized. With great difficulty, all five managed to find the overturned yacht in the darkness. For hours they clung to her, vainly hoping that some vessel would come within hailing distance, while the chill, slanting rain beat down upon them and the boat lurched and plunged in the heaving sea. Hour after hour passed, but no help came.

Once they fancied they saw a light from one of the lake schooners, and shouted into the darkness, but the rain beat the cry out of their mouths, and the light disappeared into the night. As the night passed they drifted a little toward the south, and gradually they were able to make out the misty stretch of light through the rain that told that Chicago was perhaps not more than two miles away.

Only two miles! Yet the young men were not good swimmers, and they dared not attempt to swim through the darkness, chilled and stiff as they were from hanging to the yacht for hours in the water.

The faint sound of bells tolling the midnight hour came dismally through the beating rain; and it was decided that something must be done at once, for two of their number were already shaking with cold. Crolius, the youngest of the party but the best swimmer, volunteered to swim to Chicago and secure aid. His comrades tried to dissuade him from the dangerous undertaking, but the brave young fellow replied that it was a case where one must risk death or all five would perish, and courageously set out to battle his way through the waves. After an hour of exhausting struggle against the elements, he managed to reach Chicago, and secured an immediate rescue party for his companions, who were brought safely to land. Although much exhausted, the little party suffered no ill effects from their adventure.

A BRAVE WOMAN

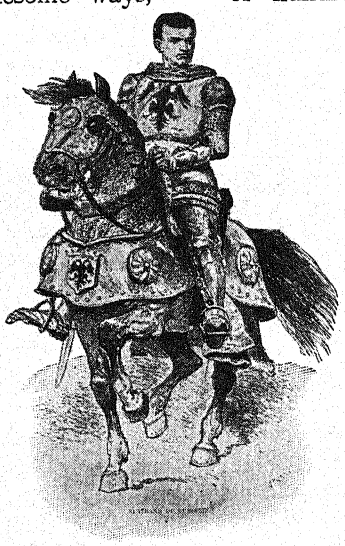
IN another part of our book we have mentioned the Carnegie Hero Fund Commission. Among the people who have received its medals for heroism is a woman, Marie B. Langdon. Through the bitter cold of a midwinter night, Mrs. Langdon, without snowshoes, went a long distance from her home, on hearing cries for help, and met a woman neighbor with her children, who had fled from their burning home. Mrs. Langdon relieved the woman of her baby and carried it back through the blinding snow to her home, followed by the mother, who was completely exhausted. Then Mrs. Langdon struggled back in the teeth of the storm for three-quarters of a mile, where she found the older child, whom they had been compelled to abandon. Removing her outer skirt, the big-hearted woman wrapped it around the child and started once more for home. On and on she beat her way, but the child grew heavier and heavier, and the blinding whirl of the snow confused her until she sank upon the ground. To her horror she discovered that the child was dead. The cold seemed closing in about her limbs, and for a moment she almost lost consciousness. Then realizing her danger, by a strong effort of will she regained her senses, and laying the child gently in the snow, she managed to battle her way through the night back to her own home.

THE BRAVE CONSTABLE OF FRANCE

DU GUESCLIN is a name honored by the French, for he was the hero of their country in the warlike Middle Ages, and French boys and girls delight in stories of what he did and said.

Bertrand du Guesclin was born between 1314 and 1320 in a castle in Brittany, and as a boy he cannot have been a very agreeable playmate—for he was obstinate, sullen, quarrelsome, and ever ready to fight. An old chronicler says he was the ugliest boy between Rennes and Dinant, that he roamed about with peasant boys, and could not be taught to read. It cannot be denied that he was headstrong and restless. At sixteen he ran away from home.

But for all his troublesome ways, the boy had in him the making of a great and clever general. He became a strong man, a brave soldier, a devoted patriot, and a defender of his country, a foe worthy of the Black Prince, so that his countrymen used to boast that they possessed the bravest general in Europe. Du Guesclin fought first in the War of Succession in Brittany, and then attracted the attention of his king, Charles V., who saw in him the very leader needed to drive the English out of France. After the Treaty of Bretigny, the free-lances, who were soldiers paid to fight for others, were disbanded and wandered about, plundering and slaying the inhabitants. The country was in a dreadful state, so King Charles bade Du Guesclin rid the land of these robber soldiers. Then the Breton gathered these men of the robber bands together and led them in an expedition against Pedro, the cruel King of Castile, who was ruling so badly that one of his half-brothers had come to beg King Charles's aid in turning him off the throne.



THE GREAT BERTRAND

Du Guesclin was successful; but when the Black Prince was sent by Edward III. of England to help the defeated Pedro, some of the soldiers went back to the side of their favorite leader, the Black Prince, so that Du Guesclin was defeated and captured at the battle of Navaretta, near the Ebro, in 1367. He was taken a prisoner to Bordeaux, where he soon grew tired of the irksome captivity.

It is said that one day the Black Prince met Du Guesclin in the town, and, going up to him, said:

"How do you do, Bertrand?"

"Well," replied Du Guesclin, "for they say I am the greatest knight in all the world, since you dare not allow me to be ransomed."

Nettled at this, the English prince told the prisoner to fix his own ransom.

"A hundred thousand livres," replied Du Guesclin.

This was an immense sum for those times; so the Black Prince asked in astonishment where he could get all that money. The reply was: "There is not a spinner in France who would not spin a distaff full to help to pay my ransom."

The French people did soon ransom Du Guesclin. Charles made him Constable of France, and, after the death of the Black Prince, he gradually freed his native land. When Du Guesclin was besieging a castle in Languedoc, the English governor promised to surrender it on a certain day if he were not relieved before. The Constable fell ill, and died before the day appointed for surrender, so that he could not take the castle. But the English governor refused to dishonor his word, marched with his garrison to the enemy's camp, and laid the keys of the castle on the dead hero's bier.

Du Guesclin's last words were: "Never forget that, wherever you wage war, the clergy, the women, the children, and the poor are not your enemies." And this was the humane principle that the brave and chivalrous warrior followed in all his campaigns and battles.

THE NEXT GOLDEN DEEDS ARE ON PAGE 2999.



THE NORMAN BARON

IN this fine poem by Henry W. Longfellow, our great American poet has taken a subject from the history of England in the early Middle Ages. He was very fond of choosing themes from English history, for, of course, an American poet has fewer incidents to choose from in American history, and must look to the old land of legend and romance for inspiring subjects of song. Longfellow prefixes to his poem a passage from a French history of the Conquest of England, which may be translated thus: "In those moments of life when the thoughts of man become more calm and deepen, and the voice of selfishness speaks less strongly than the voice of reason, when overcome by domestic sorrow, by illness, or under the shadow of death, the barons sometimes repented of having enslaved the people, and felt they had done a thing displeasing to God, who had created all men in His image." The poet, perhaps, overpraises the Norman baron's death-bed repentance, though it was a case of "better late than never."

CONTINUED FROM 2747

IN his chamber, weak and dying,
Was the Norman baron lying;
Loud, without, the tempest thundered,
And the castle turret shook.

In this fight was Death the gainer,
Spite of vassal and retainer,
And the lands his sires had plundered,
Written in the Domesday Book.

By his bed a monk was seated,
Who in humble voice repeated
Many a prayer and paternoster,
From the missal on his knee.

And, amid the tempest pealing,
Sounds of bells come faintly stealing,
Bells that, from the neighbouring cloister,
Rang for the Nativity.

In the hall, the serf and vassal
Held, that night, their Christmas wassail;
Many a carol, old and saintly,
Sang the minstrels and the waits.

And so loud these Saxon gleemen
Sang to slaves the songs of freemen,
That the storm was heard but faintly,
Knocking at the castle gates.

Till at length the lays they chaunted
Reached the chamber terror-haunted,
Where the monk, with accents holy,
Whispered at the baron's ear.

Tears upon his eyelids glistened,
As he paused awhile and listened,
And the dying baron slowly
Turned his weary head to hear.

"Wassail for the kingly stranger
Born and cradled in a manger!
King, like David, priest, like Aaron,
Christ is born to set us free!"

And the lightning showed the sainted
Figures on the casement painted,
And exclaimed the shuddering baron,
"Miserere, Domine!"

In that hour of deep contrition,
He beheld, with clearer vision,
Through all outward show and fashion,
Justice, the Avenger, rise.

All the pomp of earth had vanished,
Falsehood and deceit were banished,
Reason spoke more loud than passion,
And the truth wore no disguise.

Every vassal of his banner,
Every serf born to his manor,
All those wronged and wretched creatures,
By his hand were freed again.

And, as on the sacred missal
He recorded their dismissal,
Death relaxed his iron features,
And the monk replied, "Amen!"

Many centuries have been numbered
Since in death the baron slumbered
By the convent's sculptured portal,
Mingling with the common dust.

But the good deed, through the ages
Living in historic pages,
Brighter glows and gleams immortal,
Unconsumed by moth or rust.

THE SONG OF THE SHIRT

Thomas Hood, one of the most lovable of English poets, was equally great in comic and serious verse. We have already read three of his poems in our book, and that given here is one that will never be forgotten. Only a powerful poet whose heart had bled for the poor and oppressed could have written these moving and burning verses. It is well to remember in reading them that their author could make us laugh as few other poets have ever done, and that it is usually those who see the comic side of life that can best understand and express its serious and tender side.

WITH fingers weary and worn,
With eyelids heavy and red,
A woman sat, in unwomanly rags,
Plying her needle and thread—
Stitch—stitch—stitch!
In poverty, hunger, and dirt,
And still with a voice of dolorous pitch
She sang the "Song of the Shirt!"

"Work—work—work!
While the cock is crowing aloof;
And work—work—work
Till the stars shine through the roof!
It's oh! to be a slave
Along with the barbarous Turk,
Where woman has never a soul to save
If this is Christian work!

"Work—work—work!
Till the brain begins to swim;
Work—work—work
Till the eyes are heavy and dim!
Seam, and gusset, and band—
Band, and gusset, and seam—
Till over the buttons I fall asleep
And sew them on in a dream!

"Oh, men with sisters dear!
Oh, men with mothers and wives!
It is not linen you're wearing out,
But human creatures' lives!
Stitch—stitch—stitch,
In poverty, hunger, and dirt,
Sewing at once with a double thread
A shroud as well as a shirt.

"But why do I talk of Death?
That phantom of grisly bone,
I hardly fear his terrible shape,
It seems so like my own—
It seems so like my own,
Because of the fasts I keep;
O God! that bread should be so dear,
And flesh and blood so cheap!

"Work—work—work!
My labour never flags;
And what are its wages? A bed of straw,
A crust of bread—and rags.
That shattered roof, and this naked floor,
A table, a broken chair—
And a wall so blank, my shadow I thank
For sometimes falling there.

"Work—work—work!
From weary chime to chime,
Work—work—work
As prisoners work for crime!
Band, and gusset, and seam—
Seam, and gusset, and band—
Till the heart is sick, and the brain benumbed,
As well as the weary hand.

"Work—work—work!
In the dull December light,
And work—work—work
When the weather is warm and bright;
While underneath the eaves
The brooding swallows cling,
As if to show me their sunny backs,
And twit me with the spring.

"Oh! but to breathe the breath
Of the cowslip and primrose sweet—
With the sky above my head,
And the grass beneath my feet!
For only one short hour
To feel as I used to feel,
Before I knew the woes of want
And the walk that costs a meal!

"Oh! but for one short hour!
A respite however brief!
No blessed leisure for love or hope,
But only time for grief!
A little weeping would ease my heart;
But in their briny bed
My tears must stop, for every drop
Hinders needle and thread!"

With fingers weary and worn,
With eyelids heavy and red,
A woman sat, in unwomanly rags,
Plying her needle and thread—
Stitch—stitch—stitch!
In poverty, hunger, and dirt,
And still with a voice of dolorous pitch—
Would that its tone could reach the rich!—
She sang this "Song of the Shirt!"

THE ANGELS' WHISPER

Samuel Lover, born in Dublin, February 24, 1797, and died July 6, 1868, was a celebrated Irishman who did many things well. He began life as an artist, wrote two famous novels, some plays, many charming songs, and was a successful entertainer. This is one of his best-known songs, and even young readers will at once recognize the melody of its verse and the tender feeling it so beautifully expresses.

A BABY was sleeping,
Its mother was weeping,
For her husband was far on the wild raging sea;
And the tempest was swelling
Round the fisherman's dwelling,
And she cried: "Dermot, darling, oh, come back to me!"

Her beads while she numbered
The baby still slumbered,
And smiled in her face as she bended her knee.
"Oh, blessed be that warning,
My child, thy sleep adorning,
For I know that the angels are whispering with thee.

"And while they are keeping
Bright watch o'er thy sleeping,
Oh, pray to them softly, my baby, with me,
And say thou would'st rather
They'd watch o'er thy father,
For I know that the angels are whispering with thee."

The dawn of the morning
Saw Dermot returning,
And the wife wept with joy her babe's father to see,
And closely caressing
Her child, with a blessing,
Said: "I knew that the angels were whispering with thee."

THE LAY OF THE LAST MINSTREL

This is another and very familiar example of Sir Walter Scott's romantic poetry. The scene of the story is the borderland between England and Scotland, where Sir Walter lived, and whose legends he loved to relate. The words of the minstrel's own song are not given here. The minstrel of the past was one of the many picturesque figures that vanished with the changing ages, and we fear that the wandering singers and musicians of our own time are poor substitutes for him.

THE way was long, the wind was cold;
The Minstrel was infirm and old;
His withered cheek, and tresses grey,
Seemed to have known a better day;
The harp, his sole remaining joy,
Was carried by an orphan boy.
The last of all the bards was he,
Who sung of Border chivalry;
For, well-a-day! their date was fled;
His tuneful brethren all were dead;
And he, neglected and oppressed,
Wished to be with them, and at rest.

No more, on prancing palfrey borne,
He carolled, light as lark at morn;
No longer courted and caressed,
High placed in hall, a welcome guest,
He poured to lord and lady gay
The unpremeditated lay.
Old times are changed, old manners gone,
A stranger filled the Stuarts' throne;
The bigots of the iron time
Had called his harmless act a crime;
A wandering harper, scorned, and poor,
He begged his bread from door to door,
And tuned, to please a peasant's ear,
The harp a king had loved to hear.

He passed where Newark's stately tower
Looks out from Yarrow's birchen bower;
The Minstrel gazed with wistful eye;
No humbler resting-place was nigh.
With hesitating step, at last,
The embattled portal-arch he passed,
Whose ponderous grate and massy bar
Had oft rolled back the tide of war;
But never closed the iron door
Against the desolate and poor.
The duchess marked his weary pace,
His timid mien and reverend face,
And bade her page the menials tell,
That they should tend the old man well;
For she had known adversity,
Though born in such a high degree;
In pride of power, in beauty's bloom
Had wept o'er Monmouth's bloody tomb!

When kindness had his wants supplied,
And the old man was gratified,
Began to rise his minstrel pride:
And he began to talk anon,
Of good Earl Francis, dead and gone,
And of Earl Walter—rest him God!—
A braver ne'er to battle rode:
And how full many a tale he knew
Of the old warriors of Buccleuch;
And would the noble duchess deign
To listen to an old man's strain,
Though stiff his hand, his voice though weak,
He thought e'en yet, the sooth to speak,
That, if she loved the harp to hear,
He could make music to her ear.

The humble boon was soon obtained;
The aged Minstrel audience gained.
But, when he reached the room of state,
Where she with all her ladies sate,
Perchance he wished his boon denied;
For, when to tune his harp he tried,
His trembling hand had lost the ease
Which marks security to please;
And scenes, long past, of joy and pain,
Came wildering o'er his aged brain,
He tried to tune his harp in vain.
The pitying duchess praised its chime,
And gave him heart, and gave him time,
Till every string's according glee
Was blended into harmony.
And then, he said, he would full fain
He could recall an ancient strain,
He never thought to sing again;
It was not framed for village churls,
But for high dames and mighty earls;
He had played it to King Charles the Good,
When he kept court in Holyrood;
And much he wished, yet feared to try,
The long-forgotten melody.

Amid the strings his fingers strayed,
And an uncertain warbling made;
And oft he shook his hoary head.
But when he caught the measure wild
The old man raised his face and smiled;
And lightened up his faded eye
With all a poet's ecstasy!
In varying cadence, soft or strong,
He swept the sounding chords along;
The present scene, the future lot—
His toils, his wants—were all forgot.
Cold diffidence, and age's frost,
In the full tide of song were lost;
Each blank, in faithless memory void,
The poet's glowing thought supplied;
And, while his harp responsive rung,
'Twas thus the latest Minstrel sung.

. . . . .

Hushed is the harp—the Minstrel gone
And did he wander forth alone?
Alone, in indigence and age,
To linger out his pilgrimage?
No. Close beneath proud Newark's tower
Arose the Minstrel's lowly bower;
A simple hut; but there was seen
The little garden hedged with green,
The cheerful hearth, and lattice clean.

. . . . .

So passed the winter's day, but still,
When summer smiled on sweet Bowhill,
And July's eve, with balmy breath,
Waved the bluebells on Newark heath;
When throstles sung on Harehead shaw,
And corn waved green on Carterhaugh,
And flourished broad, Blackandro's oak,
The aged harper's soul awoke!
Then would he sing achievements high
And circumstance of chivalry,
Till the rapt traveller would stay,
Forgetful of the closing day;
And noble youths, the strain to hear,
Forsook the hunting of the deer;
And Yarrow, as he rolled along,
Bore burden to the Minstrel's song.

TO A WATERFOWL

William Cullen Bryant, who was born at Cummington, in the State of Massachusetts, November 3, 1794, and died in New York, June 12, 1878, was one of the greatest poets America has produced. In his poetry we find a deep understanding of Nature and a steady, serene faith in the Providence which guides the wondrous life of earth. The manner of his poetry is, however, rather that of a scholar than of one who sings direct his untaught thoughts of Nature. In the following poem these qualities are all displayed.

WHITHER, midst falling dew,
While glow the heavens with the last steps of day,
Far, through their rosy depths, dost thou pursue
Thy solitary way?

Vainly the fowler's eye
Might mark thy distant flight to do thee wrong,
As, darkly painted on the crimson sky,
Thy figure floats along.

Seek'st thou the splashy brink
Of weedy lake, or marge of river wide,
Or where the rocking billows rise and sink
On the chafed ocean-side?

There is a Power whose care
Teaches thy way along that pathless coast—
The desert and illimitable air—
Lone wandering, but not lost.

All day thy wings have fanned,
At that far height, the cold, thin atmosphere.
Yet stoop not, weary, to the welcome land,
Though the dark night is near.

And soon that toil shall end;
Soon shalt thou find a summer home and rest,
And scream among thy fellows; reeds shall bend
Soon o'er thy sheltered nest.

Thou'rt gone, the abyss of heaven
Hath swallowed up thy form; yet, on my heart
Deeply hath sunk the lesson thou hast given,
And shall not soon depart.

He who, from zone to zone,
Guides through the boundless sky thy certain flight
In the long way that I must tread alone,
Will lead my steps aright.

A TERNARIE OF LITTLES

The word "ternarie" signifies a group of any three things, each of which may be different. Thus Robert Herrick, whose famous poem, "Fair Daffodils," we read on page 2131, has given the above title to these very dainty verses because in each one of them he mentions three "littles."

A LITTLE saint best fits a little shrine,
A little prop best fits a little vine;
As my small cruse best fits my little wine.

A little seed best fits a little soil,
A little trade best fits a little toil;
As my small jar best fits my little oil.

A little bin best fits a little bread,
A little garland fits a little head;
As my small stuff best fits my little shed.

A little hearth best fits my little fire,
A little chapel fits a little choir;
As my small bell best fits my little spire.

A little stream best fits a little boat,
A little lead best fits a little float;
As my small pipe best fits my little note.

BABYLAND

This charming little poem recalls the children's verses of the late Eugene Field, which we know so well, but it is not by him, having been written by an author named George Cooper.

"HOW many miles to Babyland?"
"Any one can tell!
Up one flight;
To the right.
Please to ring the bell."

"What can you see in Babyland?"
"Little folks in white—
Downy heads,
Cradle-beds,
Faces pure and bright."

"What do they do in Babyland?"
"Dream and wake, and play,
Laugh and crow,
Shout and grow.
Jolly times have they!"

"What do they say in Babyland?"
"Why, the oddest things!
Might as well
Try to tell
What a birdie sings!"

"Who is the Queen of Babyland?"
"Mother, kind and sweet;
And her love,
Born above,
Guides the little feet."

THE RIVER

Poets have ever loved to write of flowing streams, for there is nothing in Nature so charged with poetry and the mystery of life as the river on its way to the sea. It is the commonest illustration of this moving, changeful life of ours, and has been used in many different ways, as suits the poet's mood. We saw with what dramatic power Kingsley wrote of the river in his poem on page 2664, while Tennyson in "The Brook," on page 103, and Southey in "The Cataract of Lodore," on page 1292, deal with the poetry of rushing water with wonderful effect. But the following is just a pretty song by Mr. Frederic E. Weatherly, who turns the river and its music into a soothing melody of gentle life.

WHERE do you come from, river sweet?
Whence do your wavelets roam?
Is it a lake, or a mountain brake,
Where fairies make their home?
Is it a land where children play,
Or old folks dream at close of day?
"Nay," said the river, whispering low,
"It is from Babyland I flow!"

Why do you hurry, O river fleet?
Can you not stay your stream,
And waft me tenderly soft and sweet
Back to that land of dream?
Can we not turn and play once more
In Babyland, as we played of yore?
"Nay," said the river, "that may not be,
There's no returning for you or me!"

Whither away, I cried again,
Whither away, O stream?
Do you rest at last when your journey's past
In some beautiful land of dream?
Is it a land that we may know,
And find the peace of the long ago?
"Yes," said the river, "a land that's blest;
'Tis the land of love and eternal rest!"

THE BELLS. By Edgar Allan Poe

Edgar Allan Poe is one of the most remarkable poets America has produced, and, with the exception of Walt Whitman, the most individual genius in American poetry. He was born in Boston, Massachusetts, on January 19, 1809, and died in Baltimore, on October 17, 1849, after an unsettled and disastrous life. No modern poet or writer of fiction has excelled him in weird and "uncanny" imaginings. He is also a great master of word melody. In the following famous poem, which has long been popular as a recitation by reason of its dramatic force, one can see how the verse steadily increases in its measure of music and changes in character from the jingling sound of the light sledge-bells to the far-resounding noise of the great city bells ringing in the still night.

I.

HEAR the sledges with the bells—
Silver bells!
What a world of merriment their melody foretells!
How they tinkle, tinkle, tinkle,
In the icy air of night!
While the stars that oversprinkle
All the heavens seem to twinkle
With a crystalline delight;
Keeping time, time, time,
In a sort of Runic rhyme,
To the tintinnabulation that so musically swells
From the bells, bells, bells, bells,
Bells, bells, bells—
From the jingling and the tinkling of the bells.

II.

Hear the mellow wedding bells,
Golden bells!
What a world of happiness their harmony foretells!
Through the balmy air of night
How they ring out their delight!—
From the molten golden notes,
And all in tune,
What a liquid ditty floats
To the turtle-dove that listens, while she gloats
On the moon!
Oh, from out the sounding cells,
What a gush of euphony voluminously wells!
How it swells,
How it dwells
On the Future; how it tells
Of the rapture that impels
To the swinging and the ringing
Of the bells, bells, bells,
Of the bells, bells, bells, bells,
Bells, bells, bells—
To the rhyming and the chiming of the bells!

III.

Hear the loud alarum bells—
Brazen bells!
What a tale of terror now, their turbulency tells;
In the startled air of night
How they scream out their affright!
Too much horrified to speak,
They can only shriek, shriek,
Out of tune,
In the clamorous appealing to the mercy of the fire,
In the mad expostulation with the deaf and frantic fire.
Leaping higher, higher, higher,
With a desperate desire,
And a resolute endeavour
Now—now to sit or never,
By the side of the pale-faced moon.
Oh, the bells, bells, bells!
What a tale their tenor tells
Of Despair!
How they clang and crash and roar!
What a horror they outpour
On the bosom of the palpitating air!
Yet the air it fully knows,
By the twanging,
And the clanging,
How the danger ebbs and flows;
Yet the air distinctly tells,
In the jangling,
And the wrangling,
How the danger sinks and swells,
By the sinking or the swelling in the anger of the bells—
Of the bells—
Of the bells, bells, bells, bells,
Bells, bells, bells—
In the clamour and the clangour of the bells!

IV.

Hear the tolling of the bells—
Iron bells!
What a world of solemn thought their melody compels!
In the silence of the night,
How we shiver with affright
At the melancholy menace of their tone;
For every sound that floats
From the rust within their throats
Is a groan.
And the people—ah, the people—
They that dwell up in the steeple,
All alone,
And who tolling, tolling, tolling,
In that muffled monotone,
Feel a glory in the rolling
On the human heart a stone—
They are neither man nor woman—
They are neither brute nor human,
They are Ghouls:
And their king it is who tolls;
And he rolls, rolls, rolls,
Rolls
A pæan from the bells!
And his merry bosom swells
With the pæan from the bells!
And he dances and he yells;
Keeping time, time, time,
In a sort of Runic rhyme,
To the throbbing of the bells—
Of the bells, bells, bells—
To the sobbing of the bells;
Keeping time, time, time,
As he knells, knells, knells,
In a happy Runic rhyme,
To the rolling of the bells—
Of the bells, bells, bells—
To the tolling of the bells,
Of the bells, bells, bells, bells—
Bells, bells, bells—
To the moaning and the groaning of the bells.

SAY NOT THE STRUGGLE NAUGHT AVAILETH

Arthur Hugh Clough is one of the most noteworthy among the lesser poets of England. Born at Liverpool on New Year's Day, 1819, he died at Florence, November 13, 1861. His poetry is not only beautiful in form but is weighted with thought, and these four short verses make up a little gem of poetic form and enlarging thought.

SAY not the struggle naught availeth,
The labour and the wounds are vain;
The enemy faints not, nor faileth,
And as things have been they remain.

If hopes were dupes, fears may be liars;
It may be, in yon smoke concealed,
Your comrades chase e'en now the fliers,
And, but for you, possess the field.

For while the tired waves, vainly breaking,
Seem here no painful inch to gain,
Far back, through creeks and inlets making,
Comes silent, flooding in, the main.

And not by eastern windows only,
When daylight comes, comes in the light;
In front the sun climbs slow, how slowly!
But westward, look, the land is bright!

THE INDUSTRY OF ANIMALS

We here give another of the poems of Thomas Miller, the poor basket-maker who became a poet and author of some note and whose writings are always of a pure and elevating character.

THE lute-voice birds rise with the light,
Their nestling young to feed,
Pursue the insects in their flight,
Or pluck the feathery seed.

The golden-belted humming-bee
Goes toiling hour by hour,
Over the moor and distant lea,
Wherever grows a flower.

With weary journeys up and down,
He home his honey brings,
From gardens in the distant town,
And while he labours sings.

The long-tailed field-mouse to the wood
Makes journeys many a score,
And in a granary piles his food,
And hoards his wintry store.

Within the hollow of a tree
The nimble squirrel hides
His meat and nuts right cunningly,
And for the cold provides.

His home the mole makes underground,
With runs and chambers crossed
And galleries circling round and round,
In which you would be lost.

Although the swallow in her nest
Displays such art and skill,
She has no tools save her white breast,
And small sharp-pointed bill.

There's not an insect crawls or flies
But what has work to do,
And the same God their wants supplies
Who watcheth over you.

No single thing did God create
But He for it gave food,
And whether it be small or great,
"He saw that it was good."

AULD LANG SYNE

There is probably no song in any language that has ever attained such a world-wide and enduring popularity as this famous song, partly, if not entirely, written by Robert Burns. Like most of his popular songs these words were composed for an old tune, though not for the tune to which it is usually sung, that being also an old Scots melody. It is the homely and human sentiment of the song that has won for it universal favor, even among people who are only dimly conscious of the real meaning of the old Scots words. There are many of these words in it that require some explanation. but we need only say that it is a song in praise of friendship and "old time's sake."

SHOULD auld acquaintance be forgot,
And never brought to mind?
Should auld acquaintance be forgot,
And auld lang syne?

For auld lang syne, my jo,
For auld lang syne,
We'll tak' a cup o' kindness yet,
For auld lang syne.

And surely ye'll be your pint-stoup,
And surely I'll be mine;
And we'll tak' a cup o' kindness yet,
For auld lang syne.

We twa hae run about the braes,
And pu'd the gowans fine;
But we've wander'd mony a weary fit
Sin' auld lang syne.

We twa hae paidled i' the burn
Frae morning sun till dine;
But seas between us braid hae roar'd
Sin' auld lang syne.

And there's a hand, my trusty fiere,
And gie's a hand o' thine;
And we'll tak' a right gude-willie waught,
For auld lang syne.

LITTLE WHITE LILY

Dr. George Macdonald contrives in these pretty little verses to state a simple fact from the life of the flowers in language that is at once child-like and yet perfectly expressive. It would be a good thing if some grown-up people who are fond of using needlessly long words, in the hope of appearing wise, would learn from this poem how much can be said in words that a child uses every day.

LITTLE white Lily
Sat by a stone,
Drooping and waiting
Till the sun shone.
Little white Lily
Sunshine has fed;
Little white Lily
Is lifting her head.

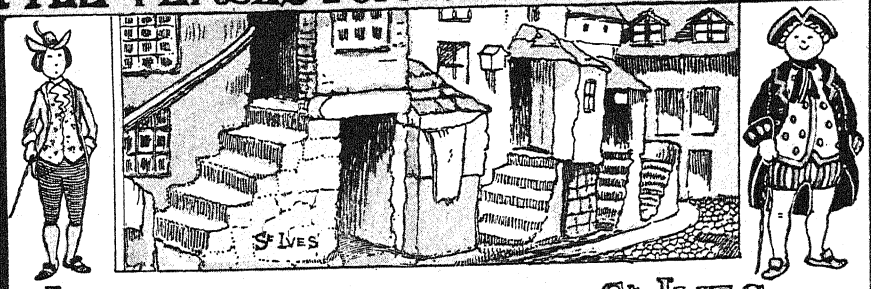
Little white Lily
Said: "It is good;
Little white Lily's
Clothing and food."
Little white Lily
Drest like a bride!
Shining with whiteness,
And crown'd beside!

Little white Lily
Droopeth with pain,
Waiting and waiting
For the wet rain.
Little white Lily
Holdeth her cup,
Rain is fast falling
And filling it up.

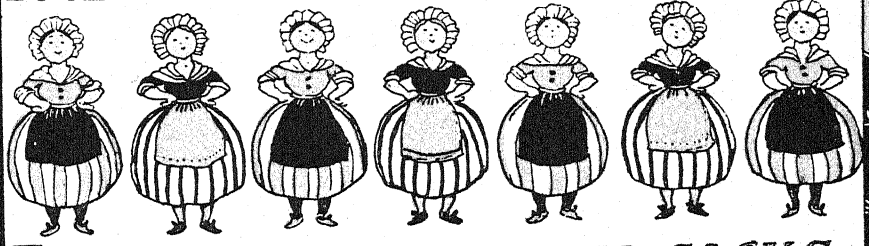
Little white Lily
Said: "Good again,
When I am thirsty
To have nice rain;
Now I am stronger,
Now I am cool;
Heat cannot burn me,
My veins are so full."

Little white Lily
Smells very sweet:
On her head sunshine,
Rain at her feet.
"Thanks to the sunshine,
Thanks to the rain!"
Little white Lily
Is happy again!

LITTLE·VERSES·FOR·VERY·LITTLE·PEOPLE·



AS I WAS GOING TO St IVES,
I MET A MAN WITH SEVEN WIVES;



EVERY WIFE HAD SEVEN SACKS,



EVERY SACK HAD SEVEN CATS;



EVERY CAT HAD SEVEN KITS:

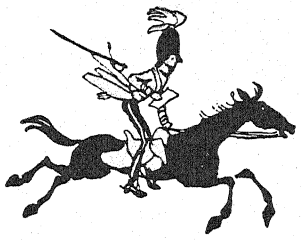


KITS, CATS, SACKS, AND WIVES,



HOW MANY WERE THERE GOING
TO St IVES ? ? ? ?

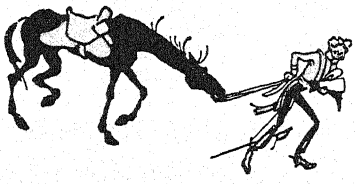
S C Burnside

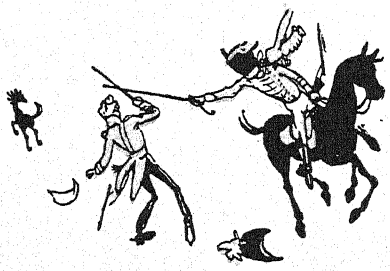
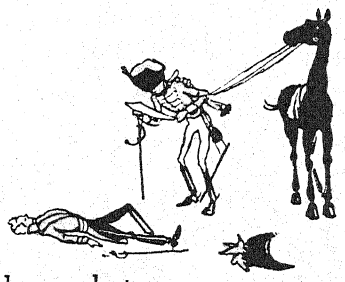
For want of the nail the shoe was lost;



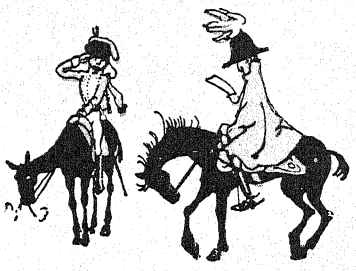

For want of the shoe the horse was lost;




For want of the horse the rider was lost;

For want of the rider the battle was lost;

For want of the battle the kingdom was lost;
And all for the want of a horse-shoe nail.

AS I went to Bonner,
I met a pig
Without a wig,
Upon my word and honor.

THERE was a jolly miller
Lived on the River Dee;
He worked and sang from morn till night,
No lark so blithe as he;
And this the burden of his song
For ever used to be—
I jump mejerrime jee!
I care for nobody—no! not I,
Since nobody cares for me.

WE are all in the dumps,
For diamonds are trumps,
The kittens are gone to St. Paul's,
The babies are bit,
The moon's in a fit,
And the houses are built without walls.

WHAT is the news of the day,
Good neighbor, I pray?
They say the balloon
Is gone up to the moon!

MARCH winds and April showers
Bring forth May flowers.



HIGH diddle ding,
Did you hear the bells ring?
The Parliament soldiers are gone to the King!
Some they did laugh, some they did cry
To see the Parliament soldiers pass by.

WEE Willie Winkie runs through the town,
Upstairs and downstairs in his night-gown,
Rapping at the window, crying through the lock,
"Are the children in their beds, for now it's eight o'clock?"

ONE misty, moisty morning,
When cloudy was the weather,
There I met an old man
Clothed all in leather;
Clothed all in leather,
With cap under his chin—
How do you do, and how do you do,
And how do you do again?

HECTOR PROTECTOR was dressed all in green;
Hector Protector was sent to the Queen.
The Queen did not like him,
No more did the King;
So Hector Protector was sent back again.


ONE, TWO
BUCKLE MY SHOE;
THREE, FOUR
KNOCK AT THE DOOR;
FIVE, SIX
PICK UP STICKS;
SEVEN, EIGHT
LAY THEM STRAIGHT;
NINE, TEN
A GOOD FAT HEN;
ELEVEN, TWELVE
DIG AND DELVE;
THIRTEEN,
FOURTEEN,
MAIDS A'COURTING;
FIFTEEN, SIXTEEN, MAIDS IN THE KITCHEN;
SEVENTEEN, EIGHTEEN, MAIDS A'WAITING;
NINETEEN, TWENTY, MY PLATE'S EMPTY.
S.C. BURNSIDE.

WHAT THIS STORY TELLS US

WE have learnt what are the various kinds of things which either must be included in our diet on pain of death or, like sugar and fat, are extremely desirable, though not quite necessary for life. But, as a rule, the foods which we eat do not consist of, say, pure proteid, about which we read on page 2731, but of a great mixture of food-stuffs, together with a quantity of material which cannot be digested at all, and usually with a great admixture of water. We now begin to study some of our common foods to see how they rank when they are examined chemically, and to learn how far we are wise in using them. We may find, for instance, that clear beef-extract, which is regarded as a food by many people, contains none of the substances necessary for life except water and salt; and with people for whom money is scarce, this is a very important thing to know.

NATURE'S WONDERFUL FOOD

CONTINUED FROM 2732



THERE is only one instance in which Nature has set out to make a food. The wheat plant grows, and produces food material in its grain, not for the sake of the children of men, but for the sake of the children of wheat. The fish, the sheep, the chicken, and the egg come into existence as part of the life of the living races to which they belong. The time is for ever past when we can have the folly to imagine that the only purpose these things have is to serve us. If we leave ourselves out of the question altogether, we still find that throughout the whole of Nature, with one exception, the animal and vegetable food of living creatures was not first brought into being to be a food, but was brought into being for itself, to live its own life. Only once has Nature set out to make a food—a substance brought into being and existing only in order to be a food.

We may reasonably expect that this food will be hard to beat, that it will contain everything necessary for life, and that it will contain these things in the exact proportions that are needed. That is precisely what we find. There are as many kinds of milk as there are kinds of mammalian animals, or mammals. The word comes from *mamma*, which is the proper name for the udder of a cow. In each case the young creature has different needs. It may be a young whale, or a young antelope or a young human being. These lead different lives in different surroundings and different temperatures; they develop at different rates, and therefore the milk provided for these creatures differs suitably in each case. More than this, it differs from week to week, or month to month, according to the needs of different stages of development in the young creature.

The needs of all life are really the same. Every kind of milk that exists contains proteid, sugar, fat, and various salts; but the proportions of these things differ. Now, the milk we are to study here is cow's milk, simply because that is what we usually drink; and though we said that milk is a perfect food, we are to understand that each milk is a *perfect* food only for the creature for whom it was made. The cow's milk was made for the calf, for whom it is a food perfect and complete; it is not so for the human baby, nor for grown-up human beings, nor even for grown-up cattle. The objection to it in the case of ourselves, when we are grown up, is only a slight one, namely, that it is rather too dilute, which means that it contains more water than is quite convenient. Yet no one can name any other food that is so nearly perfect even for grown-up human beings as cow's milk, and people can live upon it and recover health from it after the gravest disease without the help of anything else.

Milk and its products, especially

cream, ought to be the great staple of the diet of children. No baby, of course, could survive without milk; and the needs of the small baby, as it grows older, do not change so quickly as some people suppose. The commonest mistake in the feeding of children in the second and third and fourth year in America is not giving them enough milk.

Nothing could be a greater mistake than to judge the value of foods by their stiffness and solidity. Plaster of Paris is stiff, and milk is not; milk is a perfect food, and plaster of Paris is no food at all. We underestimate the value of milk simply because it is a fluid, but we do not suppose that a lump of sugar is lost when it is melted in a cup of tea. We quite understand that the sugar is still there and that we are getting it. Now, milk is really made of various things, just as solid as a lump of sugar, which have been melted in water simply for convenience. Directly milk is swallowed, it is promptly turned into solids, or is clotted, as we say. This is done by a ferment in the stomach. It is well to add a little rennet, which is really the same ferment, to a glass of milk, so as to satisfy ourselves that milk is really "solid nourishment."

THE THINGS THAT MAKE UP THE GREAT VALUE OF MILK AS FOOD

When milk clots, in the stomach or outside it, it forms a curd, which consists of most of the proteid of the milk and all the fat. The clear whey which is left contains the sugar, the salts, and a small part of the proteid of the milk. It follows from this that it is possible to live on whey, and, though it is rather a thin kind of nourishment, it saves the life of many a baby who can use nothing else. But no one could possibly live on curd only. Let us consider for ourselves what it is that curd lacks which is necessary for life, and which whey, though it looks so poor compared with curd, contains. The particular proteid in whey—without which, of course, it could not sustain life—is perfectly well known to all of us. For when we boil milk it slowly stiffens, and forms the "skin" on the top, which a few grown-up people and many children throw away, but which is one of the most valuable things in milk. The sugar of milk is a special sugar which is not found anywhere else. It is rather less sweet than the sugar we put in tea. It has the beautiful property of being far less ready to be broken up by microbes than any other sugar. The invaluable salts of milk, upon which bones and teeth, to mention nothing else, depend, always include the following elements: potassium, sodium, calcium, magnesium, iron, phosphorus, and chlorine. The proportion of potassium is strikingly high because that is specially required for the growth of muscle; as for the lime or calcium, no other food, except yolk of egg, contains so much.

ONE OF THE COMMON DANGERS OF THE COMMON USE OF MILK

Milk is very apt to contain all sorts of unusual things because it offers to the body one of the means by which these may be got rid of. This is very important practically, because it applies to all kinds of milk, and it means that many babies are injured because they get in their mother's milk, alcohol which those mothers have drunk, perhaps on the advice of ignorant doctors who think that alcohol makes good milk. Also, all sorts of medicines pass in this way, and often the best way to give medicine to a baby is to give it to its mother.

Now, all this applies to cows. If improper things are given to cows as part of their food, the cows are very apt to get rid of them in their milk. Every day in the year many human babies suffer, and not a few are in the long run killed, because they are upset by swallowing cow's milk containing all sorts of oily substances given to the cow, because they appear in the milk, and look like cream. They are not cream, however, but dangerous intruders in the milk.

HOW A DOG IN THE FARMYARD MAY SPOIL THE COW'S MILK

All kinds of excitement and worry also affect the composition of milk, and every careful farmer knows that, if he wants consistently good quality of milk from his cows, he must neither send them to be exhibited at shows, nor must he, for instance, allow a dog to get among them and frighten them. The making of milk is an act partly under the control of the nervous system, and if the nervous system is thrown out of gear, the milk produced may be actually poisonous.

The great difficulty about cow's milk, not only in the case of babies, but also in the case of many grown-up people, is that, when it clots in the stomach, the clot is very dense and thick, and therefore difficult to digest. The calf has far stronger powers of digestion than we have. The remedy is to add to the milk a little soda-water or lime-water, and then we find that the clot which is formed in the stomach is light and loose and flaky.

Cream contains the whole of the fat in milk, but it is a mistake to suppose that that is all. A good deal of the proteid is caught up in the cream too, and thus cream is a very highly concentrated and excellent food, though, of course, not a complete food. There is no form of fat or oil, whether derived from the sheep, or from plants, or from the liver of the cod, or from anywhere else, that can compare with the fat of milk which is contained in cream. It is probable that there would be no such thing as rickets, which means bad teeth and crooked bones, and many worse things, if all children could get enough cream or even enough good milk. Fortunate are those children who get enough good milk, and still more fortunate if they get cream as well.

THE VALUE OF CREAM AND BUTTER AND OF THE CHEAPER OLEOMARGARINE

Failing cream, butter is excellent. That, too, is dear, but much cheaper than cream. It contains about eighty-two parts in a hundred of fat, or, say, twice as much as cream. No other fat is nearly so easily digested, and butter can hardly be too highly praised. If it is cooked, however, the heat is apt to change it partly so that it may upset people. Not only is butter very rich in fat which is very easily digested, but even when very large quantities of it are taken, not so much as one part in two hundred fails to reach the blood.

It is possible to make from animal fats a substance which is very nearly the same as butter. This is oleomargarine. It contains the same proportion of fat as butter, and it is the same fat. In certain other respects it has the advantage of butter, for it keeps better, and cannot so easily become rancid. It is almost as well absorbed as butter. It is, of course, very much cheaper, and the highest English authority says "that there is every reason to wish that the prejudice against it, which is still rather widespread, should quickly disappear, and that it should be welcomed as an admirable and cheap substitute for a rather expensive but necessary food."

HOW CHEESE GIVES STRENGTH TO MUSCLE AND BLOOD AND BRAIN

One other product of milk we must mention, and that is cheese, which, like butter, is made from milk through the action of microbes. We shall see later that microbes have other relations to milk. Cheese is very highly nutritious. A pound of Cheddar cheese represents very nearly the whole of the proteid and most of the fat in a gallon of milk. Beef contains less than half as much nourishment as the same weight of cheese. Of course, cheeses vary considerably in their proportion of food material, and as in the case of fish, and, indeed, of food in general, cost has no relation to value. In the case of food and drink, it is always flavor that is paid for. Careful inquiry leads our best authority to the following conclusion, which, I think, does not need to have any of its words explained: "To the man who wishes to use cheese as a cheap and efficient substitute for meat, say: Buy American (including Canadian) or Cheddar, preferably to any other; for in that way you will be getting by far the most nutriment, in other words, the most muscle and blood and brain, for the money you spend."

Large books, of course, have been written about milk and its products as foods, and this is natural enough, as there is no other food that can compare with it. There is only one other point, however, which we have space for here, and that is the value of milk as a food for the nervous system.

WHY BRAIN-WORKERS AND NERVOUS PEOPLE SHOULD USE PLENTY OF MILK

In this respect milk has no rival. The food that comes nearest to it is eggs, and we can understand the place of these two things as foods for nerves, if we understand that from what is in the egg, aided only by heat and oxygen, the brain of the chicken is actually made; while milk is the food prepared for the development of the brain in all those animals that have the highest brains. The health of the whole body depends upon the brain,

which always develops in front of the body, and then helps the body to follow after it. Thus we should expect milk to be specially designed for the benefit of brain-tissue. That is what we find. But brain always retains its importance in the case of human beings, and so, therefore, should milk as a food. For brain-workers, and for nervous persons who suffer from sleeplessness and brain fag and so on, there are no foods like milk and cream; and it may almost be said that milk is the only medicine worth anything in such cases.

All this must be insisted upon because most people have the idea that milk is a food for babies and red meat a proper food for men. But the men who are studying these things—men who want to get the best work out of their minds, or who are training for long-distance races—are beginning to know better. Nothing makes good red blood like white milk, different though their colors be. What makes blood red is iron, and the one food which contains iron in absolutely perfect form for the body to use is milk.

A REALLY IMPORTANT QUESTION THAT SHOULD BE ATTENDED TO

The Japanese have hitherto used very little milk, for Japan as a country is very poor, or was until a few years ago, in animals generally—horses, cattle, sheep, and so on. But the Japanese are aware by their study of modern science that all other foods are second-rate compared with milk. Hitherto there has been very little milk to be had in Japan, and it has been very little used as an article of diet.

Now, not only are the Japanese a rather small and stunted people, but also the proportion of their very small babies that die is enormous. This is not the case, however, with those fed by their mothers. The Japanese are trying to remedy these things, and to strengthen their power as a nation by drinking more milk. We believe in being a strong nation here also, but our legislatures do not pay anything like the attention that they should pay to the really important things. We spend too much time in trying to make good citizens out of boys who did not have enough milk when they were children, boys with bad teeth and crooked bones and narrow chests, and this idea fails, and will always fail. We need good citizens, and we shall always need them, but we need first of all men with healthy bodies—and healthy minds—to make good citizens out of.

THE ANIMAL THAT INVENTED MILK, ON WHICH OUR LIFE DEPENDS

The life and power of all the higher animals, which we call mammals, depends upon milk. It is a pity that we cannot discover exactly what the earliest beginnings of milk were, but we believe it was some branch either of the amphibians or the reptiles that invented this wonderful fluid, and so began the mammalian order. We can at least arrange before our minds all the kinds of mammalian animals now existing, to see whether any general fact is taught us by them. There is such a fact, and a great one.

We find among the lowest mammalian animals, which live in Australia, that milk is of least importance, and is used for the shortest time. But steadily and regularly as we ascend through the mammalian order, we find that the importance of milk increases along the line of real progress; and this means, of course, that the importance of *motherhood* increases.

When we come as far as the man-like apes, we find the longest period, hitherto, during which the young are dependent on milk, if they are to survive at all. If we take the total period during which the life of the young creature depends entirely upon the mother, we find it longer than in any preceding case in the history of the world, and we find also that throughout that time more is demanded of the mother.

THE CHILD IS THE MOST HELPLESS THING IN THE WORLD WITHOUT ITS MOTHER

But though the case of the man-like apes has no parallel before it, it is quite outclassed among ourselves. Here the period of dependence of the young upon their mothers is longer still; the natural period during which the mother nurses her baby has no parallel; Nature makes more demands upon the mother if the child is to survive—that is to say, if the human race is to continue—than she does of any other mother; the human being is at birth more helpless even than the baby ape; and this complete helplessness, for the like of which the whole animal and vegetable world may be

searched in vain, is longer continued than in any other case. Now, milk is the outward and visible expression of a greater thing still, which is motherhood; and the lesson we have to learn, which all those who rule nations have yet to learn, is that by the laws of Nature the importance and need of motherhood increase as life ascends, and that upon it depends the destiny of all living races.

ONE OF THE MOST ASTONISHING FACTS THAT MEN KNOW

We have already learnt that at bottom the needs of living matter are everywhere the same. Nothing is more likely than that, if Nature invents a perfect food for a human baby, that food will be very suitable even for living creatures standing at the other extreme of life—the microbes, about which we have already learnt. This is so, and, indeed, all the substances on which microbes can conveniently be grown are foods of one kind and another. None of them is better than milk as a perfect food for microbes in general. Those who cultivate microbes for study, daily avail themselves of this fact, but it has a very serious side.

All milk contains microbes—not as single spies, but in battalions. If the milk is pure and has been carefully prepared, the microbes it contains are innocent. If the milk has been boiled or treated in various ways, whether by heat or by chemicals, the microbes will be dead; but in any case they are there. It is one of the most astonishing of recently discovered facts that a sort of working arrangement exists between the human body and a particular kind of microbe, of which milk is the natural home. This microbe lives on milk sugar, or lactose, and turns it into lactic acid—the acid of sour milk. This change occurs in part in the stomach. This particular microbe lives naturally in our own bodies, and is very useful there. It prevents, when we are well, the growth of many kinds of microbes that would hurt us.

HOW TO GET PURE MILK AND HOW TO KEEP IT PURE

Many people now take sour milk every day, or actually get strains of this microbe from the druggist and add them to milk in order to preserve or to recover their health. This particular microbe is found in the air, and on every solid object wherever cows are. It is to be found in the purest milk, and doubtless has been found in milk for ages past. During that long time we and it seem to have become adapted to each other. Thus, in course of time the purest milk will turn sour unless the good microbes in it have been killed. Such milk is by no means bad for us; many people like it very much.

If cows are properly fed, so that no horrible oils get into the milk, and if they are kept clean and have plenty of fresh air and sunlight, so that they do not suffer from the terrible disease called consumption, then we have the first conditions for good milk. This should be milked by clean hands into clean pails, and the hair and clothes of the milker should be covered with some clothing that has been boiled, and the cow itself should be looked after very carefully. The milk in hot weather should then be cooled immediately, and packed into bottles sealed with a clean seal. No milk should ever be allowed to be exposed to the air; indeed, no food of any kind should be allowed to be exposed, but milk least of all.

A WICKED THING ABOUT MILK THAT CAN BE STOPPED, AND MUST BE STOPPED

At present, owing to our ignorance and carelessness, milk spreads various forms of tuberculosis everywhere. In the hottest quarter of the year it kills tens of thousands of babies, and it often spreads other diseases, such as typhoid fever, diphtheria, and scarlet fever. These, however, are a mere trifle compared with the enormous massacre yearly caused by milk through carrying tuberculosis from the cow to the human being, and through becoming infected with other evil microbes which kill the babies in our large cities like flies every summer. All this can be stopped any day, and must be stopped. It is certain that, to stop it, milk must become dearer—that is, reckoning in money, not in life, for milk that kills scores of thousands of people every year is dear enough. It almost seems as if the fathers of children would have to smoke one or two fewer cigars every day in order that young America should be fed on pure milk. But, first, we must learn what pure milk is, and how to provide for getting it everywhere.

THE NEXT PART OF THIS IS ON PAGE 2947.

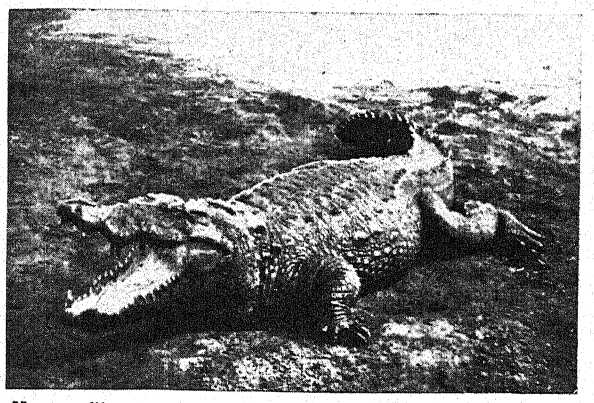
THE VERY BEGINNING OF BOOTS AND SHOES



The making of leather from skins of animals is an industry of ever-increasing importance. Here we see the well-equipped laboratory of a modern tannery, where chemists test the solutions used in tanning.



In addition to the skins of animals killed for food, large quantities of dried salted skins come from abroad. They are first of all, as shown, put into pits of water containing chemicals to make them soft.





No man likes to meet a crocodile like this, but nobody fears to carry him in his pocket like this.

NOTHING LIKE LEATHER

CONTINUED FROM 2534

STORED up in our popular proverbs is a vast amount of truth and sense, based upon the experience of men who have lived in all ages of the world's history.

According to one of these proverbs, "there is nothing like leather," and although we do not know who first made that statement, we do know that it is true. There *is* nothing like leather, and, though clever men have worked hard to invent a substitute for leather, they have not been very successful. The demand is ever growing and has always exceeded the supply. It comes from the skins of animals, and every bit of leather in the world was once alive.

Leather-dressing was one of the most important trades among the ancient Egyptians, and at Thebes, in the days of Egypt's glory, a special quarter of the city was set apart for the tanners. So great was the demand for leather that Egypt itself could not provide enough skins. One of the forms of tribute exacted from conquered nations was a number of skins, to be delivered every year for the making of leather by the skilled Egyptian tanners. In our museums we can see to-day splendidly preserved leather straps and belts used for binding round the mummies of men who lived far back in the days of Solomon. The mummies themselves, as they were carried to burial, were often covered with a pall or canopy of soft leather, dyed a delicate blue. The Egyptians used leather for making sandals, braces, belts, bags, shields, harness, sails, cushions, and chair-seats. From them the Israelites learnt the art of tanning, and, although the word leather occurs in the Bible only twice, there are many references to skins, which clearly mean leather.

The Greeks and Romans made leather, and indeed it is difficult to find any nation, ancient or modern, civilized or uncivilized, to whom leather has not been known. The most extraordinary things have been made of it. The Romans at one time had coins of leather, and some of the early cannon were made of leather.

In the making of leather from the rough skins of animals different processes are used, but they are all based upon the same principle, and are very similar. It is curious to know that the methods used by the Egyptians three thousand years ago are very much like methods still in use. Whereas in most other industries

modern science and invention have completely transformed the processes of manufacture, and made it possible to do in a tenth of the time, and with a better result, work that was formerly done by hand, in the tanning of hides and skins it has not been possible to hasten and improve the process so much.

For a great many years inventors puzzled over the difficulties of making machines that could distinguish between the different weights, thicknesses and sizes of the skins, no two of which are exactly alike. To-day, there is still much to do, but there are wonderful machines for many of the processes. Some are fitted with blades for shaving off the hair from the hides; there are machines to split the skins, and elastic and movable tables that can adjust the leather to the pressure of the tools working over its surface.

The animals whose skins make the best leather are those living in hilly countries, where there are great changes in temperature. The skins of the big cattle that we see in shows are of very little use for leather. Young animals provide better leather than old ones.

Before they can be made into leather the skins are often treated with lime, and a curious fact is that the lime used must have been used before for other skins. It was once thought that the lime itself, by some chemical action, loosened the hair. As a matter of fact, fresh lime tightens the hair in the skin. The old lime, owing to its contact with former skins, is full of bacteria, the tiny creatures that we can see only through a very powerful microscope, and these bacteria make their way down into the epidermis, destroying the roots of the hairs so that they come away easily. This fact explains the why and wherefore of a process that has been known and used for thousands of years.

THE ANIMALS FROM WHICH WE GET LEATHER

The skin of any animal can be tanned but the main sources of our leather supply are oxen, sheep, goats, and pigs. A good deal of leather is now made from the skins of seals—not fur seals, but the seals caught in the Atlantic Ocean. The skins of crocodiles, lizards, snakes, and frogs are tanned for making bags, pocket-book covers, and letter-cases. They are too horny for most other purposes.

Horse-skin provides an excellent leather, much used for the boots of sailors and fishermen, because it is exceptionally waterproof. Porpoise leather, really made from the white whale, is very strong. Elephant, rhinoceros, and hippopotamus hides make a very heavy, thick leather. The skins of sharks, buffaloes, antelopes, deer, kangaroos, wallabies, donkeys, and chamois are all tanned, but the supply is so small that it is of little commercial importance.

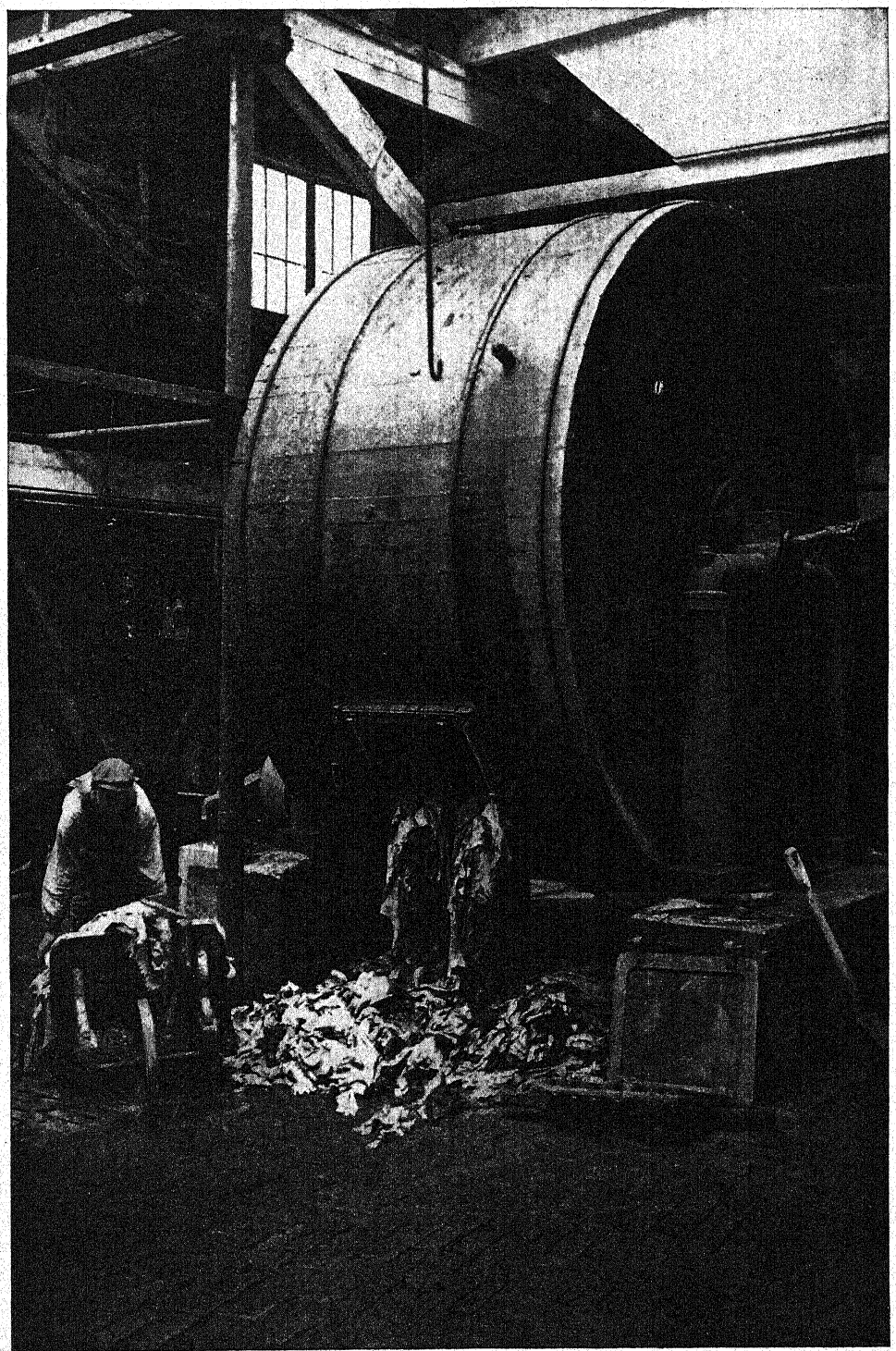
And this reminds us that the world is less and less able to get enough leather for its needs. Leather is what is known as a by-product—that is to say, the animals are reared and killed, not for their skins, but for their flesh; and as the skins happen to be there, they are used for making leather. But as people are now eating less meat than they used to and it would never pay to rear animals simply for their skins, the supply of leather is growing smaller.

During the last few years the price of some leathers has doubled, and other kinds cost several times as much as they formerly did. The uses of leather have increased also until we count them in hundreds. Leather is used for the great belts that drive big machinery, and for the small buttons on a boy's coat; it is used for upholstering a motor-car or a carriage, and for making a purse; many people of other lands who used to wear wicker sandals or wooden sabots now wear leather boots and shoes. In the Great War an enormous quantity of leather was used for boots, leggings, and other articles. So that far more leather is being asked for than can be produced.

As yet artificial leather cannot compete with the real hides, although inventors have made substitutes which are used not only for book-binding, upholstering motor-cars, and making bags and purses, but also even for the soles of shoes. The Japanese, who are great leather users, and whose ornamental leather work is very beautiful, have an imitation made from compressed layers of paper spread with a mixture of rice paste and lamp black. A Belgian invention consists of heavy cotton cloth impregnated with substances containing tannin and albumen. Several German substitutes are in use, and a good many American ones.

CONTINUED ON PAGE 3112.

THE BIG DRUM AT THE LEATHER WORKS



After coming from the water-pits where they have been soaked, sometimes for days, the skins are put into a revolving drum, like that in picture, which contains chemicals, where they are still further softened.

PREPARING THE SURFACE OF THE SKINS

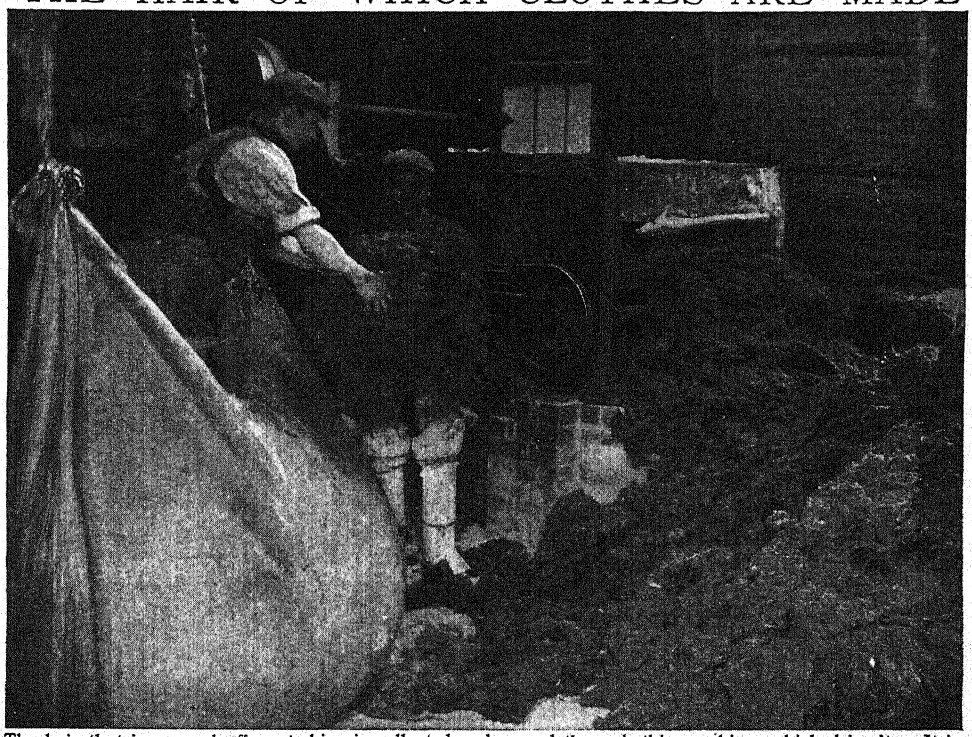


It is necessary to remove the hair from skins before they can be tanned, and one way is to lay them out on the ground, cover them with a mixture of lime, and then fold up and place them in pits for a time.



After the hair has been loosened by immersion in lime-pits, the skins are laid on boards, and hairs and outer skin are scraped off with knives. A man can unhair about 250 skins a day, but machines are often used.

THE HAIR OF WHICH CLOTHES ARE MADE

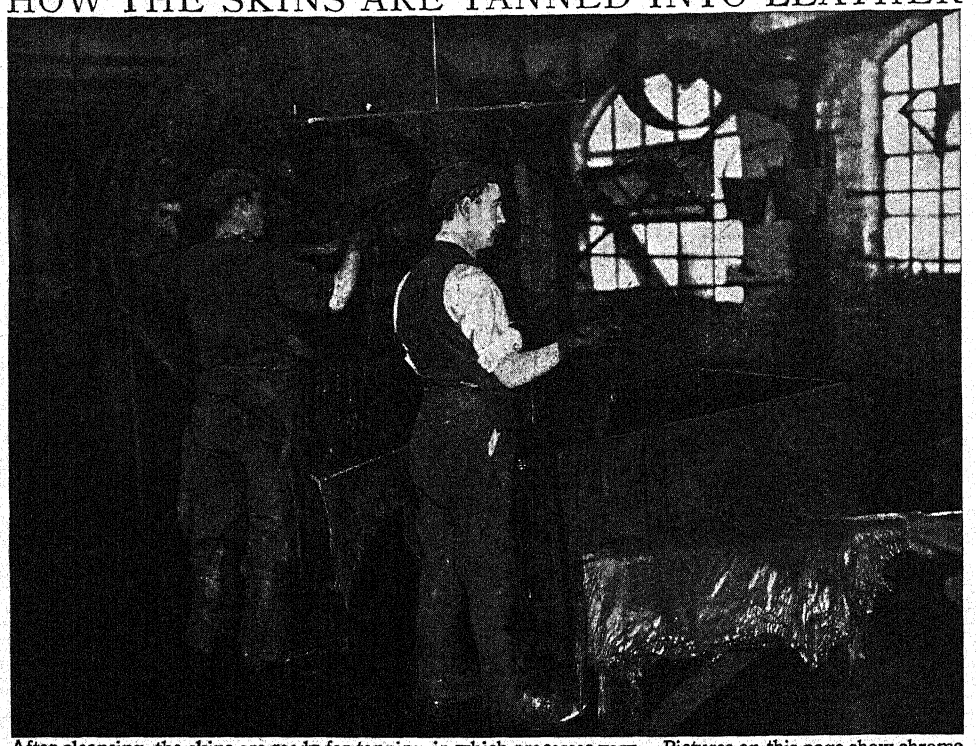


The hair that is scraped off goat-skins is collected and passed through this machine, which dries it. It is then sent to the factories to be made into cloth for cheap clothes. Good goat-hair realizes a good price.

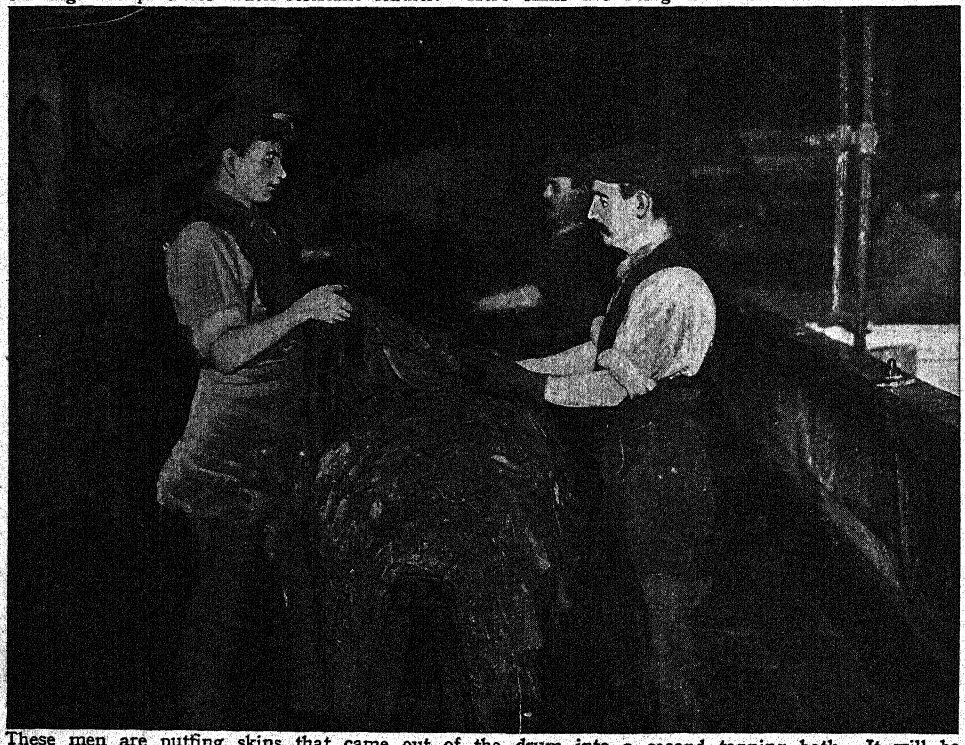


The skins now pass through several processes of cleaning before being tanned. The machine in this picture takes all dirt out of the skin, and removes any hairs that remain. It cleans about 3,600 skins a day.

HOW THE SKINS ARE TANNED INTO LEATHER



After cleansing, the skins are ready for tanning, in which processes vary. Pictures on this page show chrome tanning. It produces water-resistant leather. Here skins are being taken from a drum of acid.



These men are putting skins that came out of the drum into a second tanning bath. It will be seen that most of the men wear gloves. This is for protection, as the acid causes serious wounds.

SHAVING THE SKINS TO ONE THICKNESS

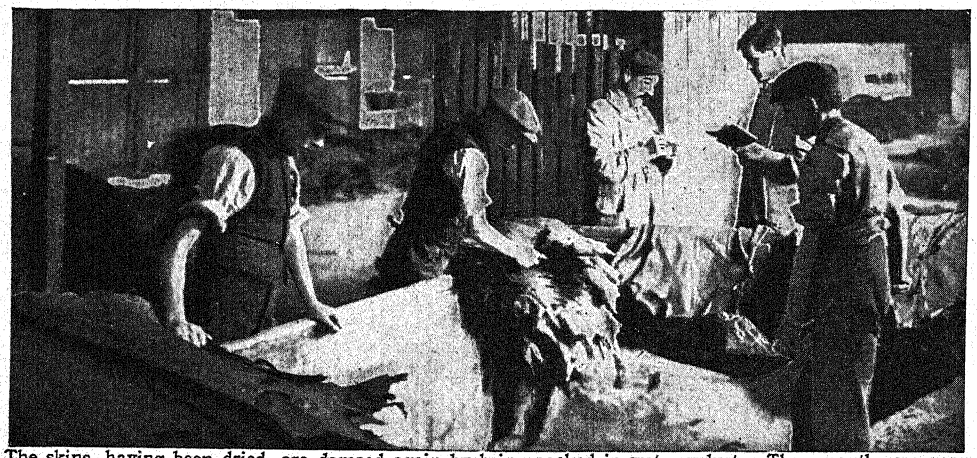


After being tanned, each skin is made of the same thickness; this machine shaves off all inequalities, or if the skins are thick enough divides them into two. The machine shaves nearly 1,000 skins a day.

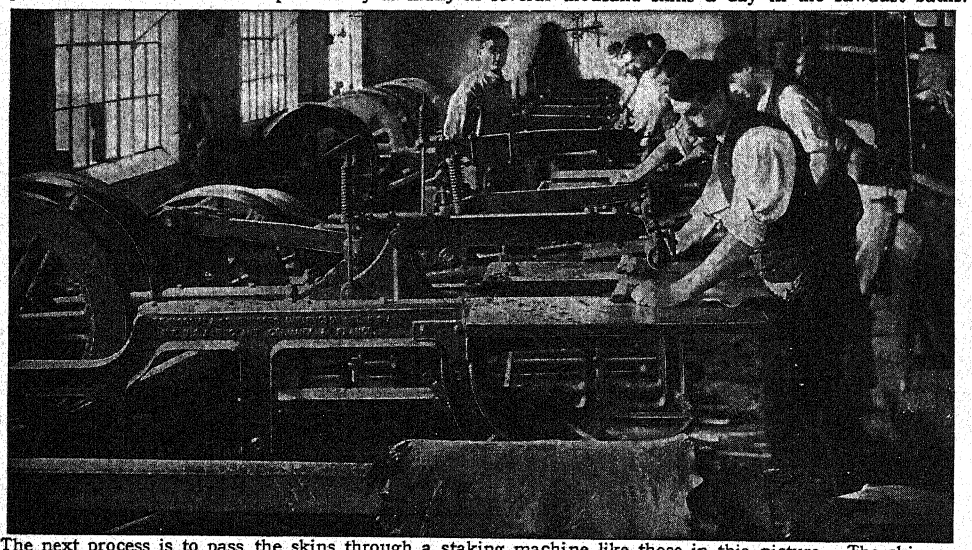


Other processes follow, and the skins are then oiled. This helps to make them waterproof. They are next placed in ovens. In many of the processes no satisfactory machinery has yet been invented.

PREPARING TO GLAZE THE LEATHER



The skins, having been dried, are damped again by being packed in wet sawdust. These youths are very quick at the work, and can pack away as many as several thousand skins a day in the sawdust baths.

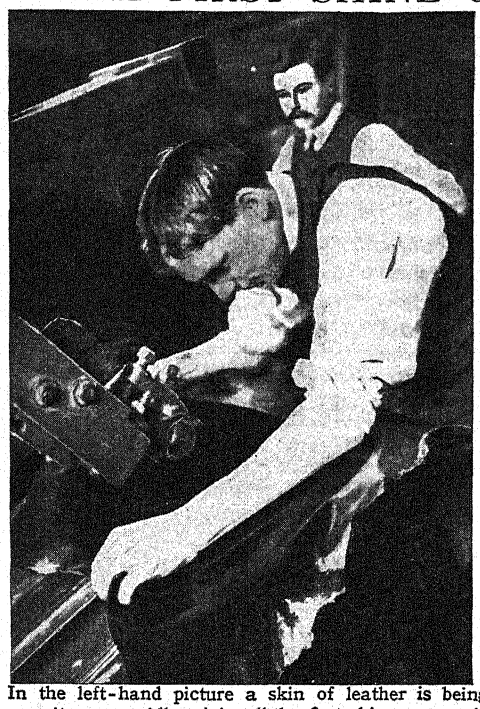


The next process is to pass the skins through a staking machine like those in this picture. The skins go through the machine twice, and, as a result, are rendered soft and pliable, with the stretch taken out.



The leather is dyed, and before it can be glazed it must have one or more coats of seasoning mixture put on to make it take the glaze, and that is what these girls are doing. Women do this better than men.

"THE FIRST SHINE ON A PAIR OF BOOTS"





In the left-hand picture a skin of leather is being glazed by a machine which rolls a glass cylinder over it very rapidly, giving "the first shine on a pair of boots." On the right the skin is being trimmed.

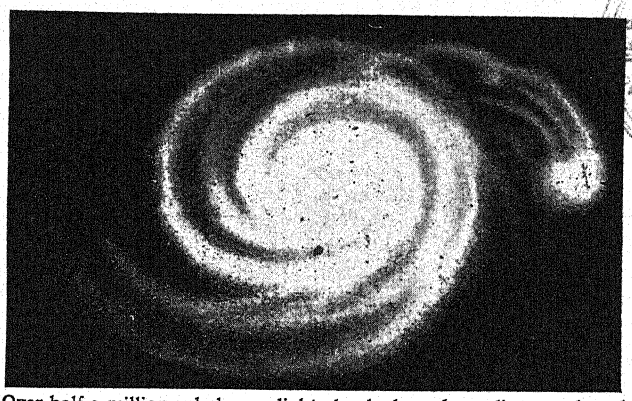


Here the finished skins are being sorted according to their substance or weight. The work demands skill and knowledge of leather, and every man who attempts it must be a thorough expert at his trade.

A MIGHTY CLOUD OF GLOWING GAS



This is one of the most wonderful photographs ever taken. It shows the great nebula that can be seen, even with the naked eye, in Orion. The nebula is a great cloud of glowing gas, more than a million times as big as the earth's orbit round the sun, and was first discovered in 1659. It was not until 1880 that it was photographed in America. The photograph on this page was taken at the famous Lick Observatory, in California, by the late Professor J. E. Keeler, one of the greatest authorities on nebulæ, and shows the nebula as it appears to astronomers through the best telescopes. By means of such photographs future generations will be able to see whether the nebulæ change at all in the course of centuries.



Over half a million nebulæ, or light-clouds, have been discovered, and at least half of these have a spiral form like the one seen here. As this great mass of glowing gas whirls round, we can see a part being thrown off, and some think this is the birth of a world like ours, with its moon.

THE MAKING OF OTHER WORLDS

CONTINUED FROM 2741



SCATTERED here and there among the stars we find cloudlike patches which are called nebulæ. The word nebula means a cloud. These nebulæ are of enormous size, occupying vastly more space than the biggest star. On the other hand, they are composed of matter which is in a very rarefied, or thin, condition, so that the mass of a nebula is very small compared with the enormous space it fills. Some idea of the size of nebulæ can be obtained from these words of Professor Newcomb: "A nebula only as large as our solar system would probably be invisible in the most powerful telescope, and could never be impressed even on the most delicate photograph of the sky unless above the ordinary brightness. Those that we know have probably hundreds or thousands of times the extent of our whole solar system."

It was not a great while ago that nebulæ were thought to be very few, for, indeed, only a few were known. If they were really very few in number, it would be difficult for us to assign to them the great part we do in the evolution of the stars. But in recent years we have begun to learn that the number of nebulæ is really very great. At the beginning of the present century it was recognized that their number ran into tens of thousands, and later it was stated that we were acquainted with 120,000 nebulæ. But the great telescope at the Lick Observatory in California has added largely to the number of nebulæ that we know, and we can positively state that the number of nebulæ is well over half a million. Doubtless, this is only a fraction of the number which will be known in fifty years or so, but it is very important for us to have, at any rate, some idea of the great number of the nebulæ, as the theory that they are stages in the history of stars evidently demands that their number should be great, as we now know it is.

And next we come to a very serious question. Suppose that there were a cluster of stars at a great distance from the earth, is it not probable that they would appear to us like a bright cloud of matter in the sky? The answer is that this would have to be so. Now, we know that there are such things as clusters of stars, and we can assign no limits to the distance of such clusters. May it not be, then, that what we call nebulæ are really nothing at all but star clusters seen at such a distance that

the individual stars cannot be distinguished from one another?

In the middle of last century Lord Rosse built a great telescope—the greatest then known—which was so powerful as to show that many appearances in the sky which had been called nebulæ were groups of stars. Their cloudy appearance was the result of their distance. Very naturally, astronomers were strongly inclined to believe that if only we had large enough telescopes all the nebulæ would be resolved into star clusters. Now, here is a case where it might have been thought that proof of what is really the truth could never be obtained. However large your telescope, you could never be certain that what looked like a nebula through it would not be seen as a star cluster through a still larger telescope.

But here again the marvelous spectroscope, about which we learned on page 2738, comes to our aid. It has proved, beyond any question, that there are real nebulæ in the skies, consisting of gas and nothing else; that they are clouds of glowing gas, and not clusters of solid stars.

WHAT WE LEARN FROM THE LIGHT GIVEN OFF BY GLOWING GAS

The evidence really depends upon what we know about the kinds of spectra which we can study on the earth. We know that when we examine the light given out by a glowing gas, which is nothing but gas, it does not consist of a continuous band of color, like the spectrum of sunlight, but of a larger or smaller number of bright lines with completely dark spaces between them. Thus we distinguish spectra as of two kinds, which are known as *continuous* and *discontinuous*. A continuous spectrum is a band of color, and is produced by the light given off from anything which is not wholly a gas; a discontinuous spectrum consists of separate bright lines, and always means that the substance producing it is purely a gas. Now, it was discovered, especially by the English astronomer Sir William Huggins, that the spectra of many nebulæ are discontinuous, proving beyond question that they are really nebulæ, or clouds of gas, and nothing else. As we have already learned, the theory that nebulæ have something to do with the making of suns or stars was first made entirely with reference to our own solar system. The idea first occurred, in his youth, to the great German thinker Kant, and it was afterwards worked out by a French mathematician called Laplace. He supposed that the solar system was made from a nebula shaped like a great globe, or sphere. He thought that this globe would in time become somewhat flattened as it spun, that rings would be detached from the outside of it and form planets.

THE SHAPE OF THE GREAT CLOUD FROM WHICH THE WORLD WAS MADE

This theory is not now maintained by anyone. Neither the solar system nor any of the systems of which other suns are the centres could be formed in this way. Rings would not be broken off in the fashion supposed, and if they were, they could not condense into planets. There are many other objections which, taken together, are quite fatal to this theory; not the least of them is that among all the nebulæ we have discovered there is not a single one which is really a ring, that would answer at all to Laplace's idea. Even the beautiful nebula in Lyra is known not to be a ring, but something else.

Laplace knew nothing whatever of any kind of nebula but a globular one, but we are in a very different position today. When Lord Rosse made his great telescope, he not only discovered with its aid that many so-called nebulæ are not really nebulæ, but he made the great discovery of what are called *spiral nebulæ*. We all know what a spiral staircase is, but we must not think of a spiral nebula as having that shape. It is a flat thing, unlike the staircase. On page 2843 we can see a photograph of a typical spiral nebula, which is, perhaps, more like a flaming "Catherine wheel" than anything else.

THE SILENT MOVING OF THE HEAVENS WHILE EMPIRES RISE AND FALL

This discovery was not at first believed; a Frenchman suggested that probably a spiral scratch had been made on one of the glasses of the telescope while cleaning it, and that this was all that Lord Rosse had seen. But we know now that spiral nebulæ are realities, and that they are very numerous. *At least one-half of all the nebulæ we know are spiral*, and the better photographs we take, the more do we find evidence of

spiral structure in nebulæ which had not previously been thought to be spiral.

Now, it is perfectly evident that this particular shape of so many nebulæ is not a matter of chance. All sorts of things are possible in the sky, and if we knew only one spiral nebula, or fifty or a hundred, we might put down this particular shape to the chance of perhaps some peculiar kind of collisions in the sky. But when we find that more than a half of all the nebulæ we know are spiral, it is quite evident that the spiral shape must represent a stage in the history of worlds.

When we study the photographs of some spiral nebulæ, we see appearances which suggest that suns or stars are being formed in them, as if the matter composing the nebula were condensing in places. There can be little doubt that such nebulæ as these are indeed forming star clusters, similar to those which we see in other parts of the sky, and those star clusters represent later stages in the history of spiral nebulæ. In the case of a system like ours, where there is only one star and not a cluster, we must suppose that the original nebula was a very much simpler and smaller thing than the spiral nebulæ we see in the sky. How many millions of comparatively small nebulæ there may be in the sky—too faint for us to see or even to photograph—no one can say. It is probable that those we see are only the giant specimens which are going to make star clusters, and not the little ones which are going to make individual stars like our sun.



This is the nebula in the southern constellation of Argo, and it is supposed that in the beginning our solar system was in this form of a vast volume of gas.

In the study of the spiral nebulæ the spectroscope again comes to our aid. It has been said that they look as if they were turning solid in parts—as if here and there stars were being formed out of the gaseous matter. The evidence of the spectroscope confirms this view, for it shows that the spectra of spiral nebulæ are not wholly discontinuous, but are just such as we should expect from a mixture of partly gaseous and partly solidifying matter.

If a spiral nebula is to condense into stars, or if a very tiny spiral nebula, such as we cannot see, is to condense down into something like the solar system, we must suppose that the nebula is spinning. It would be very satisfactory if we could watch a spiral nebula, and see it spin before our eyes. This cannot be, however. We must remember that we are looking at objects so large that to add our solar system to them over and over again would make no apparent difference. We see no spinning. Nevertheless, there is every reason to suppose that these nebulæ are spinning. It is our business to record as accurately and in as much detail as possible what we see, and so begin to provide the evidence which will enable future generations of astronomers to prove that these nebulæ are spinning. If we suppose that they are spinning, it is natural and easy to understand how separate stars or planets may be formed by being detached from the spiral branches of the nebula, and there are not a few photographs of nebulæ in which we seem to see this happening, though it is impossible to get proof in lives so short as ours. One of the best authorities says:

"The heavens show us thousands of spiral nebulæ which are evidently in a state of rotation round a central nucleus, but which will probably take ages before they have finally consolidated into suns and solar systems. But ages are but moments in the evolution of the stars, and we need not expect to find much evidence of rotation and consolidation during the brief span of human history. Empires rise and fall, dynasties are founded and dissolved, but the heavens

move on in their silent course, and the human race will probably have perished before the universe has reached its final destiny."

But I do not know that we have any right to use such words as "final destiny." It may be that there is no end to the drama of Nature. At any rate, we are beginning to find evidence that there may be new beginnings, even when the end seems to have come.

THE CHANGES THAT MAY GO ON FROM AGE TO AGE IN THE SKIES

When we were studying the stars, we traced their history through various stages of brightness until at last they became dark, cold, "dead suns." That seems to be an end, and it might be supposed that all the stars are running towards this end, so that one day there will be a universe of nothing but dead suns. But, on the other hand, we see in the heavens examples of all the earlier stages in star history, including even these hundreds of thousands of nebulæ.

There are, then, new beginnings being made, and the question is, How? Can we suppose that anything could happen to a cold, dark star which could transform it into a nebula? If this can be supposed, then our theory of star evolution begins to be complete, for instead of having a process running along a line, we shall see that there is a process running in a circle, and we may suppose that this circle, or cycle, represents what happens from age to age in the skies, and that the different kinds of object we see represent different stages of it in different cases.

DO WORLDS BEGIN IN GREAT COLLISIONS IN THE SKY?

The stars, we know, both bright and dark, are not fixed, but moving. We have clear proof also that gravitation is at work among the stars. If, then, they all have an attraction for one another according to their mass and distance from each other, and if these distances are constantly changing as they move, there is the possibility of collision.

It is more than possible; it is exceedingly probable. If a dark star and a bright one, or two dark stars, ran into one another, or merely grazed each other, what should we expect to happen? Their motion would be largely transformed by friction into heat, just as when you rub your hands together. If this heat were intense enough, it would convert all the matter of the stars into a gaseous form again; in other words, such a collision might *create a nebula.* It is natural to ask whether we have ever seen such a thing happen. It may be that we have, or, at any rate, that some of the cases where new stars have blazed out suddenly are due to some kind of collision in the sky.

Recently various astronomers have shown that if two dark stars grazed each other, or even approached closely to each other, without actually touching, there would be not only the production of great heat, but also tidal effects. These tides, it is believed, would cause explosions and eruptions of gaseous matter, and it can be proved that the matter ejected would take the spiral form. In theory, we should expect to find that in such a case there would be two spiral branches produced at directly opposite points, like tides upon the earth.

THE WONDER OF THE LIFE-HISTORY OF A STAR IN THE HEAVENS

Now, it is very remarkable that when we study the spiral nebulæ we find that they usually do have two spirals, and that in almost every case these come out from the central nucleus of the nebula at points directly opposite to each other.

Here, then, is further evidence that celestial collisions may be responsible for the creation of nebulæ from stars that have run their course. These immensely interesting ideas are comparatively quite new, and we are only at the beginning of the study of them. There is no doubt that a great part of the astronomy of the future will be devoted to the study of the spiral nebulæ.

There are many nebulæ which do not seem to be spiral at all, and many in which only traces of a spiral structure can be detected. It may very well be that nebulæ which have no spiral structure are sometimes formed by actual headlong collision between stars, dark or bright; and it is important to inquire whether such nebulæ in the course of time would tend to take a spiral form. We believe that they would. Given a shapeless nebula in which movement was going on, however irregular, it seems to be certain that in the course of time such a body would slowly begin to assume a spiral form. On the other hand, a

nebula might be spiral from the first if made as a consequence of a "grazing collision."

A NEBULA GREATER THAN MANY MILLIONS OF EARTHS

It is probable that there are dark nebulæ. It may be that a dark nebula as it shrinks gets warm and bright; that the next stage is the taking of a spiral form; then the formation of star systems or of solar systems, such as ours; and so through various stages of brightness and temperature to darkness. In the course of this long history there is probably a stage of rise in temperature, and then a stage of fall in temperature. There seems to be no doubt that our sun is in the second of these two stages.

We ought to know where to find the finest of the nebulæ. When we were describing the principal constellations, we learnt about the great nebula in Orion, which was discovered a little more than 250 years ago. We find that photographs of this amazing object show us six large stars lying in a nebula, which scatters away into space to a stupendous distance around them. When we look farther we find that these stars are only a small number of the whole, though we do not know how many of the hundreds of stars which can be seen here are really part of the nebula. We have real evidence in this particular case that slow changes are going on. Some idea of the size of the nebula may be obtained from the comparison made by Sir Robert Ball. If we could imagine a great globe bounded by the earth's path round the sun, it is certain that a million such globes could be easily engulfed in the great Orion nebula. It contains an enormous quantity of hydrogen.

THE ETHER THAT IS EVERYWHERE, AND THAT NO MAN UNDERSTANDS

We ought also to know the great nebula in the constellation Andromeda, which is not far from Cassiopeia. This splendid object is really a true spiral. So, also, is the so-called "ring nebula" in Lyra. The nebula in the southern constellation, Argo, is not spiral. Here we must end our brief study of astronomy, the oldest and most magnificent of all the sciences. We are really only at the beginning of the "new astronomy" created by the spectroscope, and no science has a greater future before it.

But a word or two must be said in conclusion regarding the greatest and most urgent of the problems which the astronomy of the future has to solve. This centres round the word "ether." The ether is certainly something as real as this paper, though it is not ordinary matter, but very different, and is believed to be absolutely everywhere. The vast "empty" spaces between the stars are all completely filled with it. It is the medium which conveys their light from one to another across billions of miles, just as it conveys the light a few inches from this page to our eyes. It is here, where the air is, and it fills the spaces between the heavenly bodies, where there is no air. It is the medium by and through which universal gravitation exerts its power.

THE RIDDLE OF THE ETHER THAT MEN EVERYWHERE ARE TRYING TO ANSWER

More than this, we now believe that what we call ordinary matter, of which our bodies, earth and sun, stars, nebulæ, and comet are composed, is really a product of the ether; and probably that after an atom has run its course, whether here or a billion miles away, it is resolved again into the infinite ocean of ether, like a melting iceberg in the sea from which it was made. As yet we know very little about the ether, and even less about the relations that exist between it and ordinary matter. We do not know whether the earth or any heavenly bodies in their movement are at all retarded by the ether, though, if they are so retarded, the influence of the ether is too slight for us to detect.

All over the world astronomers, and not only astronomers but also students of light and electricity and chemistry, are working at the riddle of the ether, for it comes into every scientific question, and is the unanswered problem at the bottom of everything. Yet there is reason to hope that the problem is not insoluble, and its solution will be the deepest scientific discovery of all time.

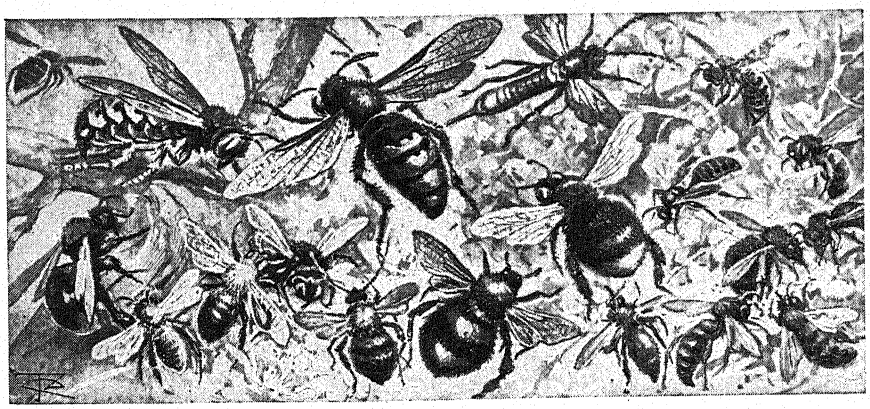
We shall next have to return to more homely matters, and learn the chief facts of geology, which is the science that deals with the history of the surface of the one heavenly body which we can study at close quarters—our own earth.

THE NEXT PART OF THIS IS ON PAGE 2913.

WHAT WE MIGHT SEE IN THE HIVE



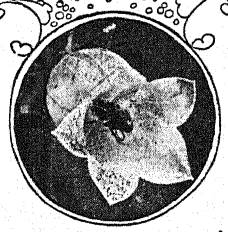
This beautiful picture shows us the bees at work on the comb. Some of them are feeding the baby bees in the cells, some of them filling cells with honey, some of them packing in pollen or "bee-bread." Down in front there are some empty cells. Perhaps an egg is in the bottom of each. The irregular pouch hanging from the bottom is a queen cell, in which a baby queen is living, getting ready to lay thousands of eggs. When she is ready to come out the old queen may lead off a swarm.



THE BEES AND WASPS

CONTINUED FROM 2709

THE insect world is more crowded with life than any other division of Nature—the sea, of course, excepted. We can never hope to count the whole number of living things in the sea, or of the tiny living things on land, but we know that the insect *species* are more numerous than the species of all the rest of the animal world.



Nobody has yet been able to classify them all; nobody ever will—the number is so vast. Science counts about 150,000 different species of beetles, and over 50,000 different moths and butterflies. Some authorities put down the number of species of insects at 5,000,000; but another student, going more thoroughly into the question, believes that in the future our scientists may classify 10,000,000 species.

Many insects are harmful to us, but others are very valuable. In spite of all that we may do with deadly powders and liquids in washing and spraying trees and plants and crops, we should be overrun with harmful insects were it not for the work of other insects. Many species of insects prey upon other insects. There are 25,000 species of ichneumon flies alone which prey upon deadly enemies of the gardener. All that they do is to follow their natural instinct; they assist us without intending to do so, without knowing anything of their value in saving the crops.

Other insects help to make outdoor life more beautiful by the splendor of their appearance. The bodies of some yield valuable medicine and dyes; others form the food of birds. But there is a more important work than this that insects do for us. Some carry the pollen from flower to flower, so making plants and trees fertile and able to yield their harvest of flowers and fruit. Without the insects many of our flowers would die out, and many trees would fail to yield perfect fruit. Some, again, act as scavengers, and perform highly important work in consuming offensive material which might be dangerous to health.

At the head of the insect family come the bees, wasps, and ants. Their skill is so remarkable, their organization so extraordinary, that there is a danger of our giving them credit for too much wonderful knowledge, and of our ascribing to very high intelligence, works and ways which proceed from that governing influence in animal life which we call instinct. But we can leave out of account the difficult problem as to where instinct ends and intelligence begins. We are tempted to believe that bees must think and reason; we know that a

Copyright, 1918, by M. Perry Mills.

sudden, unexpected event will cause them to make fresh plans, just as human beings would.

The story of the bees is like a fairy tale. They are creatures of the sunlight; their food is the sweet nectar and nourishing pollen of the flowers, just the sort of diet that fairies ought to have. They have willing workers; they have their lazy idlers. They commit murder upon a great scale every year. It is not murder to them; it is only the carrying out of a necessary law of the city in which they live. They are wonderful architects and builders; they have the gift of finding their way about in the open air back to their homes, which birds possess. They have splendid sight, keen sense of taste and smell, and they love each other's company.

We must not make the mistake, however, of thinking that all bees live in swarms, like the honey-bee. There are carpenter bees, which bore tunnels in the pith of canes or in the wood of dead trees, in fences or gate posts. Leaf-cutting bees cut dainty pieces from tender young leaves to line their tunnels in plant stems. Some bees burrow tunnels in the ground. The mason bees build little cells of sand or clay and tiny pebbles. The potter bees make little cells of earth which they fasten to the stem of a plant.

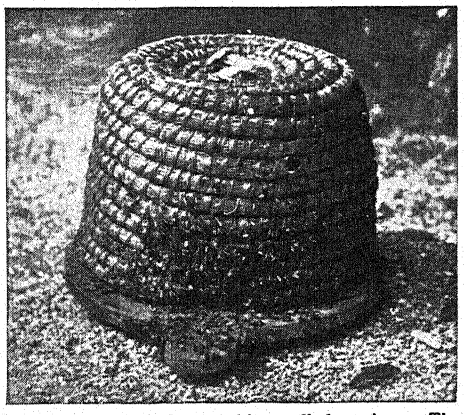
These bees are all solitary; that is, each bee works alone for her own family. Many bees make solitary cells, and each bee lives a solitary life. In some families, each bee makes several cells close together, in others large numbers of bees burrow or build in colonies. Nearly all these bees prepare food for their children from the nectar and pollen of flowers. The nectar is made into honey; honey and pollen is packed into a cell; the mother bee lays an egg in the cell, covers it up and goes away, never to see the young bee for which she has taken so much pains. Some bees, however, take no pains to prepare either food or cradle for their children. They simply go to the houses built by a mason bee or a carpenter bee, and there lay their eggs. Sometimes there is enough food for both grubs, but oftentimes the young parasite grub comes from its cell first, eats up all the food in the house, and leaves the lawful owner to perish from hunger.

Then there are the bumblebees, heavy bees, with a deep bass voice, that go droning home in the hot sunshine of the summer afternoons, heavily laden with nectar or pollen to be made into food for the baby bees. Probably many of you know where a nest of bumblebees can be found. Perhaps some of you have stolen the honey and have gone home suffering from the stings of the angry bees, and the sting is much worse than the sting of the honey-bee. If you do not know where a bumblebee's nest is, you may be able to track one to its home. You must not expect, however, to find it easily, for the bumblebees make their nest underground and the entrance is often hidden by the grass. Unlike the mason and carpenter bees, however, the bumblebees live in societies, and the young bees are fed with care. The lives of all these bees make a very interesting study. Perhaps in your vacation you may have an opportunity of watching some of them and learning their habits and ways of working. You would find it a most fascinating game.

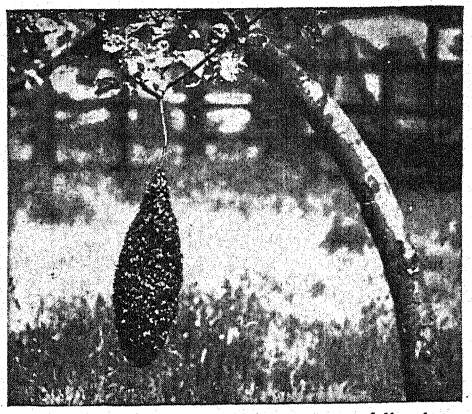
In this story, however, we are chiefly concerned with the work of the honey-bee, and now we are going to tell you something that may surprise some of you. Hive bees have not, as some of us have thought, lived here from time immemorial. As a matter of fact they were brought here from Europe. There were plenty of other bees—mason bees, carpenter bees, bumblebees and all the rest of them—in America when the white man came, but not a single hive bee. But, some one says, what of the stories we have read of wild honey, and of bears climbing hollow trees to eat the honey stored there? The stories are all quite true, but the wild bees are all descended from swarms that escaped, and were lost, a thing that may quite easily happen.

HOW THE BEES LEAVE THEIR HOME AND BUILD WITHOUT TOOLS

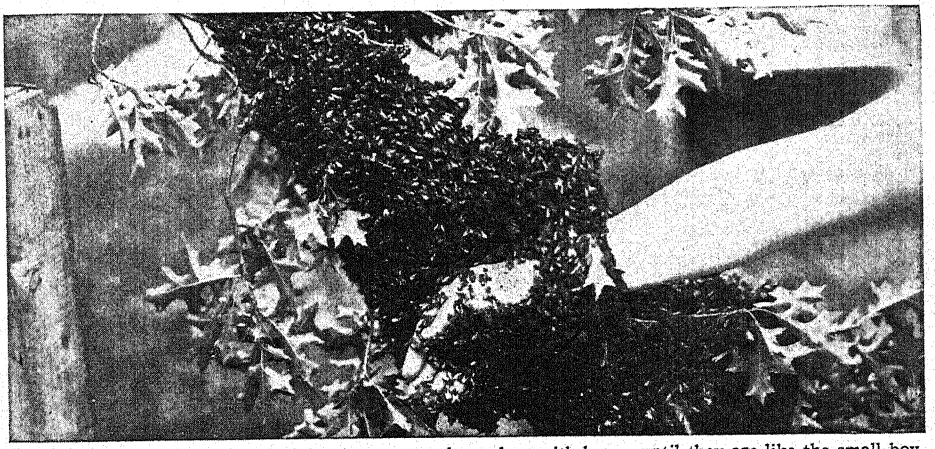
In their natural state, bees always swarm some time during the summer. For some reason, probably because the hive has become overcrowded, the queen and a large number of the workers decide to emigrate and found a new colony. When the time comes, the workers who are leaving the hive fill their sacs with honey; then with the queen at their head or in their midst they issue forth in thousands. Scouts find a new place to make a nest—a hive set by the beekeeper, or some sheltered place like a hollow tree, and there begin life anew.



This is an old-fashioned hive called a skep. The bees which are clustering about it seem ready to fly off with their queen, and set up a home of their own.

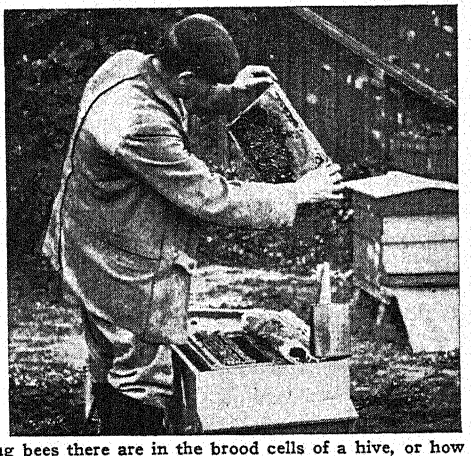


This strange-looking object is a swarm of live bees. The queen has settled on the branch of an apple-tree, and the other bees are clustered about her.



Before a hive swarms, the emigrating bees gorge themselves with honey until they are like the small boy who has eaten too much bread and jam and is too sleepy to play. While they are in this state, they seldom sting, and it is quite safe for any one who does not shrink from them to handle them. Here a girl has thrust her hand fearlessly into the swarm. A swarm can generally be induced to settle in an empty hive by putting it close by, where the scouts can find it, or by putting the queen in it.





When the bee-keeper wants to know how many young bees there are in the brood cells of a hive, or how much honey there is in it, he puffs smoke in to stupefy the bees. He can then safely lift up the frame, with the bees on it, and examine it. If he wants to extract honey, he gently brushes the bees into the hive. If the hive is crowded, another story, called a "super," can be added to provide more room for honey.

If they make their new home in a hive scientifically planned, they will find frames inside ready for them, with foundations of wax prepared. Upon this they set to work at once to build cells for the reception of the eggs, or to store up honey. But, let us suppose that a swarm has escaped from the bee garden, and makes its nest in a hollow tree in the wood. They have nothing but a dark space, with rough walls all around them, in which to make a home. It is as if we ourselves were given some mighty cavern in which to build a city. But lacking tools and materials of every sort, how should we build? The bees are in a better position. It is true, they have no artificial tools with which to work, but in their bodies they have the tools they need to build their fairy city, and, cunning chemists that they are, they are able to produce the material for its walls from the honey that they ate before they left the hive.

THE MYSTERY OF THE CHANGE OF HONEY INTO WAX

As soon as they reach the new home, a great number of the young bees suspend themselves from the roof. Those highest hang by their legs; those lower down cling to the hind legs of those above; others at the sides cling as well and a great curtain of bees hanging down from the roof is formed. There they hang, for hours, or it may be two or even three days, until in some mysterious way the honey is changed into wax. Of the way that it is done, we know nothing, except that, as they are able in some way to increase the heat of their body, heat must have something to do with the process. When the wax is made, it issues as a clear liquid from pores under the wax plates, and soon hardens into thin flakes. Meantime other workers are running over the walls, removing every speck of dust and dirt or rubbish, and making all clean and smooth and neat. When at last the wax is ready, a bee climbs up to the centre of a frame. Then it carefully gathers the wax which has collected in six little plates in the wax pockets. This the bee chews and moistens with her tongue until it becomes a soft, glue-like mass, pliable enough to build the hexagonal cells of which the comb is made. When it is quite ready the worker sticks this wax to the roof, and leaves it there. This bee returns to her place, but others follow with their store of wax, and soon there is a little heap collected on the roof to form the foundation of the comb.

THE BEE ARCHITECT COMES TO DESIGN THE COMB

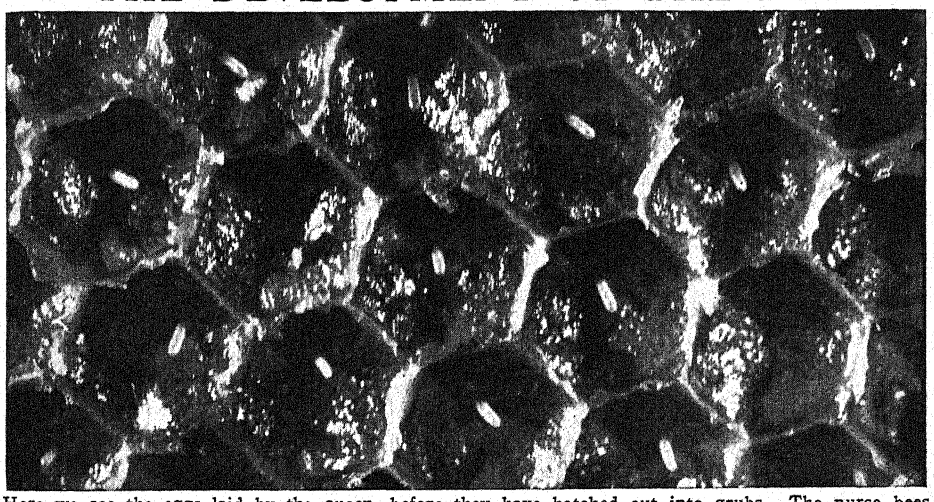
Then there comes forth an architect bee, which examines the wax with its antennae, or feelers, and finding all satisfactory, bores in the middle a hole, which is the beginning of the first cell. The material dug out is carefully pushed to one side to extend the walls of the cell. Other bees follow to deposit wax, and these give place to more architects, which excavate other cells, and the task of building the comb is now really on the way. If you look at the picture on page 2853 you will see that the comb is made of double rows of beautifully formed hexagonal cells. They are placed end to end, so that not only do the end walls of the cells form the partition between them, but the cells help to support one another. Each cell is the exact length required for the growth of a young bee. These double curtains of wax are made about half an inch apart, which allows the bees ample room to move between them, and they hang down about two thirds the depth of a hive. How did the bees learn to build these cells of exactly the right shape and size, without waste and of exactly the thickness that will hold the honey? These are questions that no one can answer. They belong to the mysteries of nature that overwhelm us by their greatness. When frames are provided, the building is very quickly done, but even when the foundations have to be laid, the work goes forward very rapidly.

Meantime the important work of the hive has been begun. While the cells are being built, the queen has been very restless and discontented, and as soon as some are completed, she goes from one to another, and in each deposits an egg. Wherever she moves the bees around her stop their work and turn their heads toward her, and she is always surrounded by a swarm of attendants. When she moves away from one circle another surrounds her. She is petted and caressed, and kept constantly supplied with all she can eat of the choicest food.

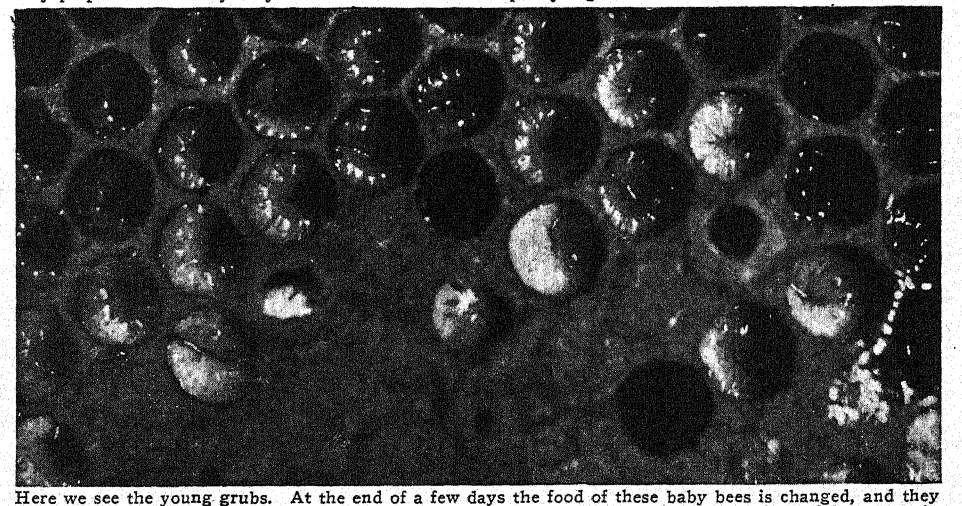
HOW THE EGG TURNS INTO A GRUB AND THE GRUB BECOMES A BEE

Now we must turn to the history of the egg. This is a little bluish-white thing, which is fastened to the bottom of the cell, and there remains for three or

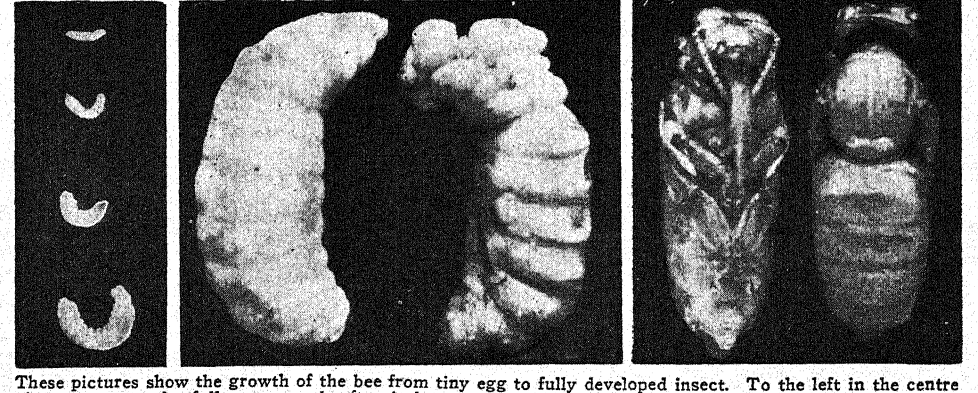
THE DEVELOPMENT OF THE BEE



Here we see the eggs laid by the queen, before they have hatched out into grubs. The nurse bees feed the grubs for a few days with a substance called "bee-milk," "bee-jelly" or "chyle-food," which they prepare from honey they have eaten. The food is partly digested in the stomach of the nurse bee.



Here we see the young grubs. At the end of a few days the food of these baby bees is changed, and they are given a mixture of honey and pollen. When the grub has reached its full growth it straightens out in the cell. The nurses then put some food in the cell, which they cover skilfully with a porous cap.



These pictures show the growth of the bee from tiny egg to fully developed insect. To the left in the centre picture we see the full-grown grub after it has spun a thin silken covering. Next we may see how it changes its shape, and the right-hand picture shows it ready to eat its way out of the narrow cell.

four days. At the end of that time a little larva or grub appears. For a few days it is fed by the nursing bees with a food called "chyle-food," or "bee-jelly," which the nurses have specially prepared. For a few days longer the young grub is fed with a mixture of honey and pollen; but when a grub has grown so that it nearly fills the cell, a little honey and pollen is placed in the cell, which is capped with a thin plate made of wax mixed with pollen. For a short time the grub feeds on the food left in the cell. Then it spins itself a robe of silk—a cocoon inside the cell—and there it rests to let Nature work its way. In a few days its form undergoes a striking change. It is no longer a grub; its internal organs have been remade; wings and legs have grown, and in about twenty-one days from the time the egg was placed in the cell the young bee is ready to come forth into the hive. With her strong mouth she gnaws away the covering of her cradle. The nursing bees help her out, and the worker bee emerges ready to prepare herself for the tasks that crowd the hours of her short and busy life. The nursing bees bring her food, help her to dress her wings, and caress and encourage her, and in a day or two she is ready to help in the care of the hive, to take her share in nursing the baby bees, and in making wax for the new cells, in feeding the queen, and in storing the honey.

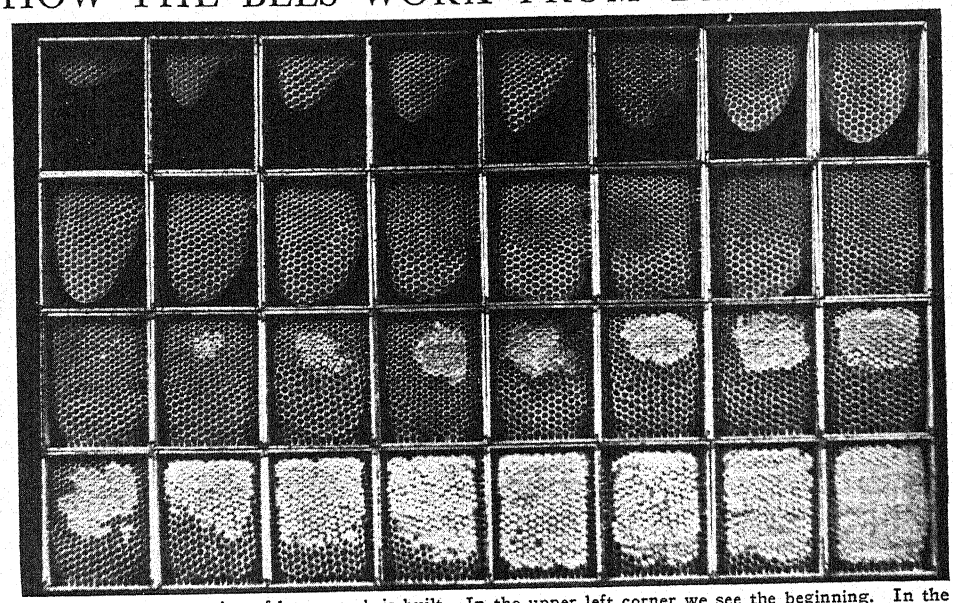
An important part of the work of the young bees is the ventilation of the hive. The hive is so densely crowded that, especially in the summer days, without ventilation the air would become so hot that the wax walls of the city would become soft, and bend. To guard against this, workers take up their stations on each side of the entrance, and vigorously fan with their wings. They create so great a current that the light of a match or candle held at the entrance is instantly blown out. The work is very exhausting and the fanners work in relays or shifts.

In less than two weeks after the worker leaves her cell, she tries her wings in the midday heat. A few days afterward she sets out on a search for honey and pollen, and until the moment of her death her life is a busy round of work.

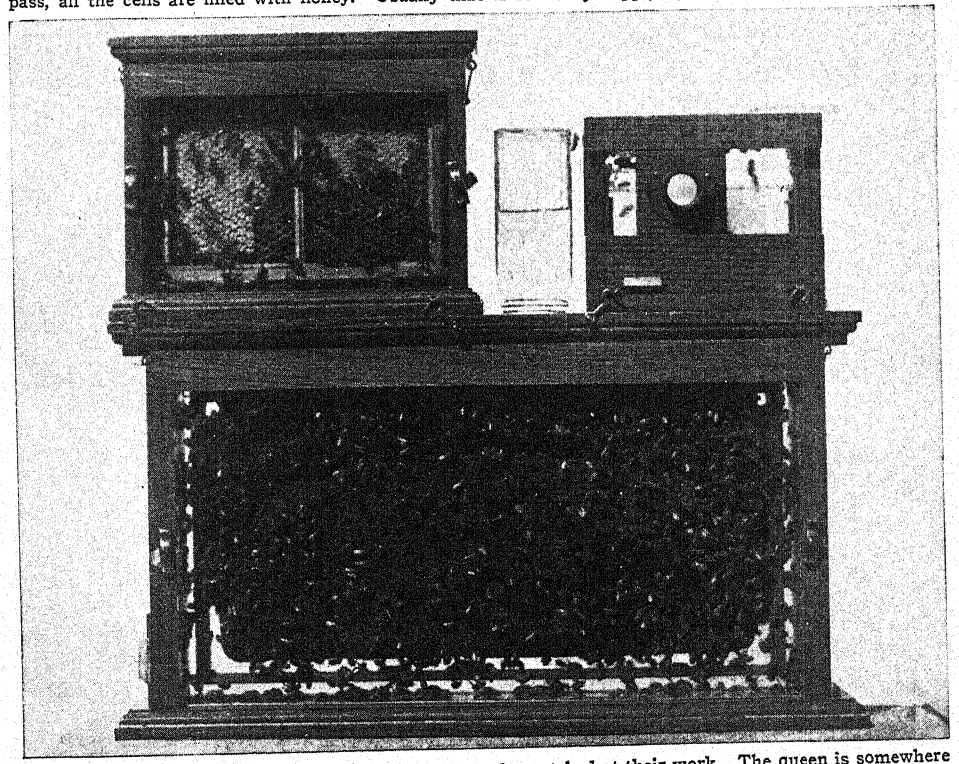
THE STRANGE STORY OF THE QUEEN BEE'S LIFE

Now we must go back to the queen and her ceaseless work of laying eggs. It is said that the queen may lay from 3,000 to 4,000 eggs in a day. She begins to lay about February, and keeps on laying until about September. In the early part of the year, the workers make nothing but worker cells, but in the summer months some larger cells are made in which drone eggs are laid, and a few specially constructed cells are made for the future queens. These royal cells are built of a porous mixture of pollen and honey and are usually placed near the edge of the comb, where there is plenty of ventilation. Now the strange thing is that the egg placed in a royal cell is exactly the same as the egg that is laid in a worker cell. The difference between the growth of the workers and of the queens is created solely by the manner of their upbringing. Suppose that some great disaster should overtake the hive, that the queen should die before provision were made for her successor, all hope for the future would be gone. It would mean that the bees would simply abandon work and die. But, and this is a marvelous thing, if there are in the hive grubs which have been not more than three days out of the egg stage, the workers take one or more of these, enlarge the cells, and feed the grubs on the bee-jelly. The change must be made, however, before the grub is three days old, or the case is hopeless; but if the treatment is begun in time the worker grub becomes large and strong; an important change is made in the structure of her body, and she becomes a queen.

From the moment that the egg in the royal cell hatches out, the workers begin the special treatment needed for the growth of the young queen. No honey or pollen is given to this royal personage. She is fed solely on bee-jelly, and is fed so generously that she floats in this rich food in her large, airy cell. When the time comes for the young queen to turn into a pupa, she spins herself a silken robe, but this does not cover her entirely as the robes of the worker and drone cover them. The queen's cocoon reaches from the head down over only half of her body. The only part in which she can be stung to death is between the rings of which the abdomen is formed. These rings are deliberately left uncovered, so that if it is her fate to die, she lies ready to be immediately sacrificed, unprotected by the silk which would hamper the fatal



This shows how a section of honeycomb is built. In the upper left corner we see the beginning. In the lower right-hand corner the section is filled and every cell sealed with a wax cover. The sections are placed in a "super" on top of the hive. As the passage from the lower hive is too small for the queen to pass, all the cells are filled with honey. Usually time is saved by supplying a foundation sheet of wax.



This "observation hive" is made so that the bees may be watched at their work. The queen is somewhere among the crowd in the lower hive, and all the bee activities are in full swing. The picture gives a good idea of the two-sided structure of the comb. On top of the hive there are two sections like those above and an apparatus for giving the bees artificial food, as they cannot get out to gather honey.

Pictures copyright, Brown & Dawson; also top of page 2853, middle of pages 2851 and 2860.

sting. The young queens grow more rapidly than the workers, and reach their full growth in about fifteen or sixteen days after the eggs are placed in the cells. They are not allowed to leave the cells at once, however. The workers pierce a hole in each cell door through which the queens are fed, but they are not permitted to leave the cell until the old queen is removed by death, or departure with the swarm.

How the workers care for the young queen

But the better to trace the life of the young queen, let us fancy ourselves back in the hive from which our first queen and her swarm of bees proceeded. A short time before she left, the young queens were ready to leave their cells. But the workers kept a close watch. The young queens were kept prisoners lest they should become the victims of the fury of the old queen, who would fall upon them and sting them to death. After the swarm has left, and the old queen with it, the workers again settle down to their tasks. The unrest of the swarming time is over, and the steady hum of the working bees begins again. But the hive is now queenless, and the workers hasten to help the young queens to freedom, and now comes one of the tragedies of the bee community.

As the most advanced queen emerges from her cell, the nurses rush to help her. They caress her, offer her honey from their mouths, brush and clean her to remove any shreds of stickiness which may have adhered to her in the cell. As soon as the little stranger feels strength come into her legs and jaws, she is seized with fury. No other queen must live while she is in the hive, and if the workers let her, she will rush to the cells of her sister queens, tear open the cells, and sting the occupants to death. It sometimes happens, however, that the hive has been so much overcrowded that its numbers, after the first swarm, are still too great. In that case the workers keep the new queen from destroying the royal cells; she leaves the hive with another swarm and another queen is allowed to live. Sometimes it happens that more than one queen comes from the cells on the same day. In such a case the queens fight one another and sting one another to death until only one is left.

It sometimes happens that the two bees in their struggles find themselves so placed that each could kill the other at the same moment. If they both struck now, they would die and leave the hive without a queen. They do not strike; they break away, terrified at the danger that both may be killed, and they fight again until one, more skilful or stronger than the other, can implant its sting, inflicting the fatal blow. The victor is always dutifully received as the sovereign.

During the next few days many more worker bees are hatched from the eggs which the other queen had laid, and the new queen, after one trip to the skies, will begin to lay her eggs. She in turn will now want to lead away a swarm of bees to set up a colony for themselves, and the bees are just as anxious to go. In a wild state the bees will send off several swarms in succession, from five to ten days elapsing between the departure of each swarm. But in hives owned by men this number of swarms is not permitted, or the hive would become too weak. Indeed, if the beekeeper can prevent them, the bees do not swarm at all. The queen and her court feel the desire to go, and forth they fare, flying at first only a short distance from the hive. There, upon some bough, they hang in a bunch, the bees frantically clustering about their queen to prevent her being injured.

Bees that fill themselves with honey are too lazy to sting

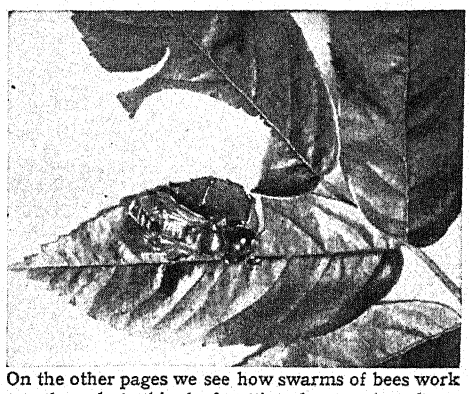
The prudent beekeeper now comes along, holds a hive upside down under the bees, and by shaking the bough up and down causes them to drop into it. He knows that they will not sting him; they have filled themselves so full of honey before quitting the hive that they have no desire to injure anybody. That, by the way, is the reason why, when we want to withdraw part of the comb containing the honey, we " smoke " the bees. We use a small pair of bellows which has attached to it a tin cup in which a piece of rag is smouldering. The bees do not understand the smoke; they think that something dreadful has happened to the hive and that they may be compelled to leave. So they rush to their stores of honey and fill themselves with the sweet food, in case they have to set forth on a journey. When they are in that condition they never sting unless they are ill-used.

The affection and reverence which the

A BEE'S CRADLE MADE OF ROSE LEAVES



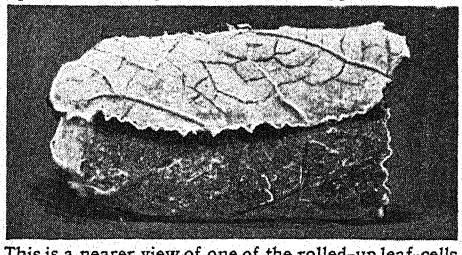
This may be the very first visit of this leaf-cutting bee to a snapdragon flower, but instinct teaches her how to force her way in to extract the honey.



On the other pages we see how swarms of bees work together, but this leaf-cutting bee works alone. Here she is cutting rose leaves for her nest.



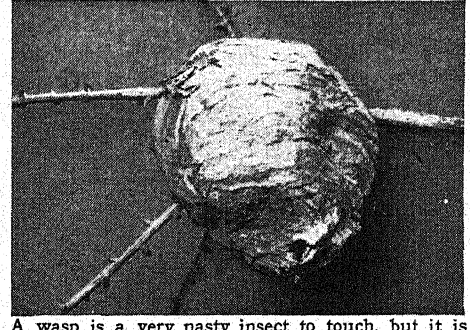
The bee stores each leaf in a tunnel which she has bored in the decayed wood of a tree. She fills each rolled-up leaf with honey and then lays an egg in it. This is a picture of wood cut open to show two such tunnels.



This is a nearer view of one of the rolled-up leaf-cells which we have seen above; it is full of honey.



Here we see the leaf-cell cut open. Inside is the little bee grub eating the honey stored by its mother.



A wasp is a very nasty insect to touch, but it is very clever. British tree-wasps build a nest like this. The nest in early summer is like a small plum, but soon it grows to be the size of a football.



Here is a wonderful wasp's nest, cut from an orange-tree in Brazil. Made of a substance like stout cardboard, it is really wood pulp, collected and worked up by the wasps. The little black hole is the entrance.

bees show their queen cannot be exaggerated. If famine overtakes the hive, they feed the queen with the best food remaining; and if the queen be sent away packed up in a tiny, tiny hive, with her personal attendants accompanying her, they feed her so long as a scrap of food remains, and die themselves rather than take anything that she might eat.

In spite of all this devotion, the stories we sometimes hear about the queen ruling over the hive are not true. The workers rule the hive, and decide what is to be done. They take care of the queen because she is the hive-mother, and without her there would soon be no bees, but the workers settle the important questions.

Modern hives are made so that the bees can be handled easily. The beekeeper takes out a queen, gives the bees another, or divides a colony whenever he thinks best. As the combs in the lower part of the hive often have young bees in them, or are dark in color, he puts special frames, or else small boxes called sections, in the upper story of the hive, in order that the bees may fill them with honey. The openings to the upper story are made too small to allow the queen to get through to lay eggs, and so the sections are filled with clear honey. You have seen these beautiful little wooden boxes many times, no doubt.

The beekeeper, or apiarist, as he is sometimes called, removes these sections and sells them. If he has placed frames above, he may cut off the caps which the bees have placed over the full cells, and put the frames into an extractor, which draws out the sweet liquid. This is the honey you buy in bottles or jars.

IF ANY BEE WILL NOT WORK NEITHER SHALL HE EAT

When we come to read all about bees in big books, or examine the hive for ourselves, we shall have to follow the lives of the drones more closely than we have here. Their lives are short and idle. They exist only that the queen bee may choose a mate from one—not of her own hive, but from the drones of another hive, while her hive supplies drones as mates for other queens. The worker bees have to feed the drones, but when the summer is ending they turn them all out of the hive to die, or else imprison them inside and starve them to death, or actually kill them. It is said that when they turn them out, the workers bite off one wing so that the drones cannot fly back into the hive, but miserably perish in the chilly night. The drones have no stings and cannot fight.

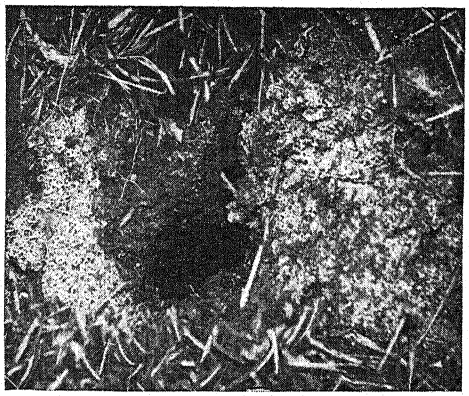
One little point we must note before leaving the hive. For all their skill, the bees are sometimes deceived. If the hive becomes weak and careful watch is not kept, the bee moth creeps in unobserved and lays her eggs in the hive. These eggs hatch out and crawl over the comb, eating the wax and leaving a nasty cobwebby trail behind. Nothing else can get in, in the ordinary course, for there are sentinels at the door, who examine every creature, friend or foe, that seeks to enter. A strange bee is at once killed or expelled, unless it brings honey, when it will be welcomed. Sometimes a big snail will enter, regardless of stings. The bees cannot have him there alive, so they wall him up. They seal up his shell with their wax, burying him alive, if they do not first sting him to death. If the shell be broken, they cover him entirely, so that no bad fumes shall escape.

THE BEE'S LONG TONGUE THAT SUCKS UP NECTAR FROM THE FLOWERS

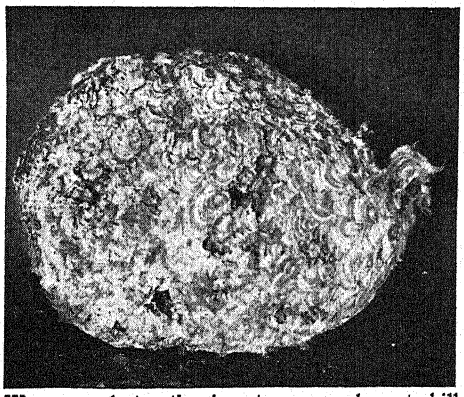
The doings of the worker bees out in the fields and gardens are as interesting as those in the hive. They have a curious sucking tongue, covered with hairs. This they protrude from a strong sheath, which acts as a channel, up which they draw the nectar from the flowers. When they enter a flower in which the nectar lies ready, they stretch out their tongues and suck up all that is available. If the nectar lies hidden, they bite their way through that part of the flower which obstructs them, and so reach it. The pollen that they collect, as they go from flower to flower, is highly important to them and to the flowers. It gets dusted over their bodies, and, as they go from bloom to bloom, the pollen of one flower is transferred to another, so carrying fertilization to each. They always take the same sort of flower on one round, so that they should not mix the pollen of various plants.

The pollen that clings to them they scrape off with their claws, and deposit in two tiny baskets which they have on the joints of their hind legs. A little of the pollen they eat as food, but the bulk of it they carry back to the hive, where the workers take it from them and use it at

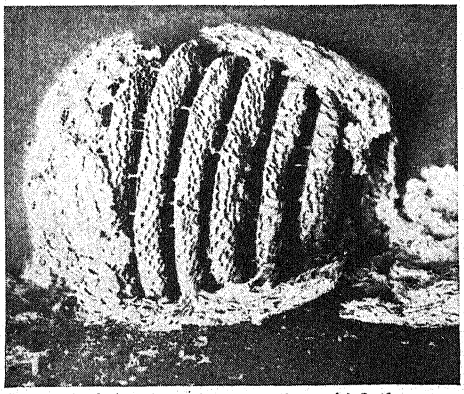
THE STRANGE HOMES OF WASPS



When we see wasps flying in and out of a hole like this, we may know that their nest is inside the hole. It is built some feet under the ground.

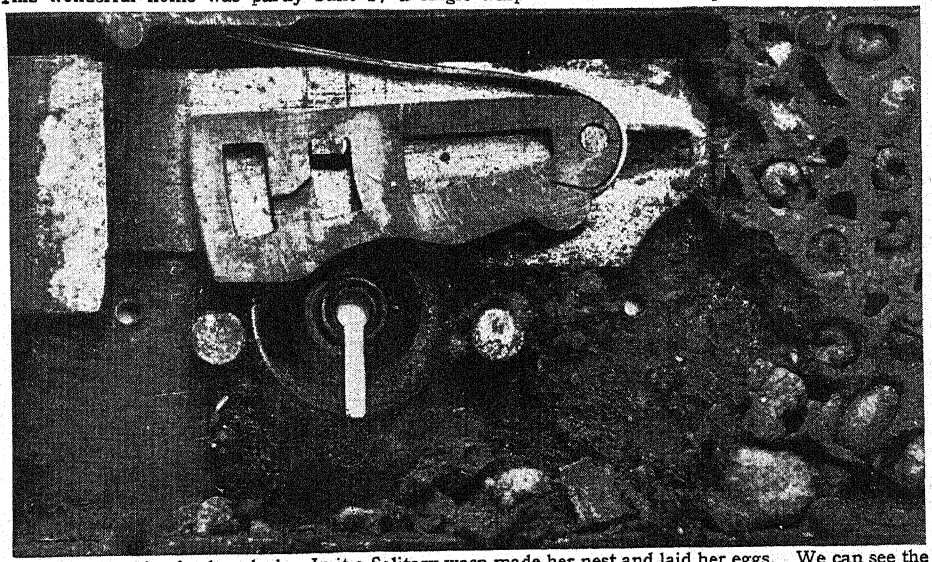


Wasps are destructive insects, so men have to kill them. They suffocate the wasps with burning sulphur, and dig out the nest, which is like this.





Stripped of the paper-like covering which the wasps have made, the nest is seen to consist of a series of cell-combs. Here we get, first a side view, and next a front view of a nest dug out of the ground. This wonderful home was partly built by a single wasp before she had any children to help her.

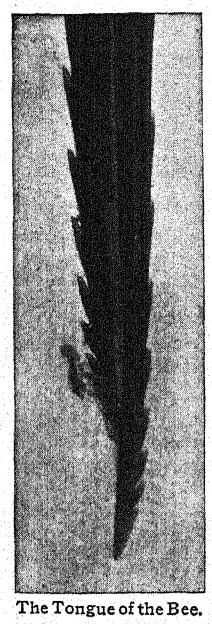


This is the inside of a door-lock. In it a Solitary wasp made her nest and laid her eggs. We can see the grubs in their cells. Perhaps because their mother did not leave them enough food they died of starvation.

once as food for the grubs, or store it in cells set apart for the purpose. The nectar which the bees sip is swallowed. Some of it is used to give the bee strength, but the great part passes immediately from the bee's mouth into the honey-pouch, where it becomes changed into honey. This honey is delivered to the hive and stored in cells, which are capped with wax as fast as they are filled.

THE WINTER LIFE OF THE BEE IN THE HIVE

When the flower season is over, and the honey-making done, the queen stops laying and the bees collect in a mass in one part of the hive. They do not sleep, and in the middle of a warm bright day many of them leave the hive, fly about in the sunshine, and bring back water to the hive. If they have not enough honey and pollen to keep them through the winter, the beekeeper supplies them with syrup to take its place. In February the queen again begins to lay eggs, and the workers again begin to pay her the attention that they ceased to show her throughout the winter months. As soon as the early spring flowers appear, the workers again begin to ply their trade, and life awakens in the hive.



The Tongue of the Bee.

A queen bee lives to the age of two or even three years. But when she begins to show signs of age, and her steps grow feeble, the workers gather round her in a mass and smother her to death, and one of her children takes her place. The life of most of the worker bees is short. Those that are born in the early summer toil so hard that they live only from three to six weeks. Those that are born at the end of the summer, however, live in the hive throughout the winter, for they are needed to care for the young bees who are born in the spring.

A STORY OF WASP LIFE

It is easy to tell the difference between bees and wasps. The wasp is of a lighter color, is more slender in build, and is not so hairy as the bee. The wasp does not make honey from the flowers, nor does it carry pollen from one to the other to fertilize it.

Although the full-grown wasps live partly on nectar from the flowers or sweet ripe fruit, the young wasps are carnivorous and must have insect food. Some wasps, who live a solitary life, sting living insects—a cricket, a weevil, or perhaps a cicada. The sting does not kill the insect, it only paralyzes it, and it is then dragged to the nest, and the wasp lays an egg on it. Then another insect is found, and another and another. The same process is gone through in every case, and the wasp goes off secure in the knowledge that she has laid up a store of food for the children she will never see.

Some wasps are solitary. There are mason and potter wasps, some of which make beautiful nests, digger wasps who dig tunnels in the ground, wasps that tunnel in the stems of plant, and wasps that lay their eggs in the nests of other wasps. Those that we know best, however, are the social wasp, the yellow-jackets and the hornets, who make large nests and, like the bees, live a social life in common.

The common wasp makes a very nice nest. The queen wasp goes to sleep for the winter in some sheltered place. When she wakes up in the spring, she finds herself without a single relative in the world. She makes a cell or two, and lays eggs in them, thus acting as both worker and queen. These eggs produce worker wasps, who build other cells, and soon a big nest is formed. Sometimes the nest reaches an enormous size, but it has all been done in a summer. All save the queen wasp die in the autumn. Of course, in a year of many wasps there remain many queen wasps.

Some of the social wasps build underground, others build the beautiful paper nests which nearly every country boy or girl knows. The covering of the nest is really made of paper. It is made from fibres of wood which the wasp chews and flattens out until it looks like a tiny ribbon, which is plastered on the nest. Inside the nest combs composed of cells are made, and in these cells the young wasps live and are fed until they have reached their full growth.

THE NEXT NATURE STORY IS ON PAGE 2965.

THE STORIES OF CHARLES DICKENS

THE last of the famous novels of Charles Dickens which we are to read here is known to have been his own favorite, for he tells us so in the preface to it. It is also, in some details, true to his own life. As we have read his life in the "Book of Men and Women," page 2326, we can see where the story resembles the biography. "David Copperfield" is written in the first person, but there are so many things to tell in it, and so little space to say them in here, that we have told the story in the third person. Although the book is a very long one, this short summary conveys its leading features. Our illustrations are from copies of the original pictures drawn for the story more than fifty years ago.

DAVID COPPERFIELD

CONTINUED FROM 2780

THE hero of this story was born, after his father's death, in a quaint old house, called the Rookery, at the village of Blunderstone, in Suffolk. There were very few relatives of his father or mother alive. Indeed, Mrs. Copperfield, now that her husband had died, and she had become the mother of David, seemed to have nothing in the world to live for but the care of her infant child. She was the delicate, clinging type of woman, not at all one of those bright, courageous women who, having felt the sorrow of a great loss, can still have heart of grace to struggle bravely against misfortune.

Nor did she receive any help in her time of trouble except from her rosy-cheeked, warm-hearted servant-maid, Clara Peggotty, who loved the gentle woman and her child. David's aunt, Miss Betsy Trotwood, the sister of his late father, might have made matters much better for his mother; but she was a strange woman, and, calling at the Rookery the very night that David was born, she was so disappointed to find that the child was a boy and not a girl—she had hoped it would be called Betsy Trotwood, after her—that she went away, and never saw David's mother again. A strange, hard-hearted woman, you may think; but later on we shall see if that is true.

David's early days were pleasant enough; what with the fond Peggotty and his gentle mother always thinking of his happiness, perhaps he was rather a spoiled child. But suddenly all was changed. A very haughty, overbearing man, named Edward Murdstone, had met the young widow of the Rookery, and determined to make her his wife and himself master of the little property that she possessed. He was a wine merchant, but not a wealthy man, and a colder-hearted stepfather could not have been imposed on little David, who was now a bright, observant boy of some four or five years. David hated the tall man with the black whiskers, and he was right in doing so; for when Murdstone did become his stepfather he crushed all the joy out of the little boy's life.

Before long David's mother also began to lose heart, for she was overruled in everything by Murdstone and his domineering sister, who took up her abode in the Rookery, and quickly took all the affairs of the house and home into her own hands. But for Peggotty's loyalty to David and his mother, the lives of both of them would have lost all sunshine. As it was, a day came when little David could not stand his stepfather's ill-treatment of him any longer, and he bit the hand of Mr. Murdstone when that person was engaged in punishing him for some imaginary offence.

The result of this conduct was that David, now about nine years of age, was packed off by the stage-coach, with a little box of clothing, all the way to London, where, at Salem House School, Blackheath, Mr. Murd-

stone had arranged for the boy to become a boarder, under the notorious Mr. Creakle, a master whose one idea of education was to thrash the boys daily. We remember Mr. Squeers, who kept Dotheboys Hall, as a terrible schoolmaster of that time, but he was little worse than Creakle. One of the tutors, poor-spirited but kindly Mr. Mell, met David at Whitechapel, and took him to Salem House, and we shall hear how he was received there in his own words.

LITTLE DAVID'S FIRST UNHAPPY DAY AT SALEM HOUSE SCHOOL

"Salem House was a square brick building with wings, of a bare and unfurnished appearance. All about it was so very quiet, that I said to Mr. Mell I supposed the boys were out; but he seemed surprised at my not knowing that it was holiday-time, that all the boys were at their several homes, that Mr. Creakle, the proprietor, was down by the seaside with Mrs. and Miss Creakle, and that I was sent in holiday-time as a punishment for my misdoing. All of which he explained to me as we went along.

"I gazed upon the schoolroom into which he took me, as the most forlorn and desolate place I had ever seen. I see it now. A long room, with three long rows of desks, and six of forms, and bristling all round with pegs for hats and slates. Scraps of old copy-books and exercises litter the dirty floor. Some silkworms' houses, made of the same materials, are scattered over the desks. Two miserable little white mice, left behind by their owner, are running up and down in a fusty castle made of pasteboard and wire, looking in all the corners with their red eyes for anything to eat. A bird, in a cage very little bigger than himself, makes a mournful rattle now and then in hopping on his perch, two inches high, or dropping from it, but neither sings nor chirps."

DAVID FINDS THE STRANGE PLACARD: "TAKE CARE OF HIM—HE BITES"

"There is a strange, unwholesome smell upon the room, like mildewed corduroys, sweet apples wanting air, and rotten books. There could not well be more ink splashed about it, if it had been roofless from its first construction, and the skies had rained, snowed, hailed, and blown ink through the varying seasons of the year.

"Mr. Mell having left me, I went softly to the upper end of the room, observing all this as I crept along. Suddenly I came upon a pasteboard placard, beautifully written, which was lying on the desk, and bore these words: *Take care of him. He bites.*

"I got upon the desk immediately, apprehensive of at least a great dog underneath. But, though I looked all round with anxious eyes, I could see nothing of him. I was still engaged in peering about, when Mr. Mell came back, and asked me what I did up there?

"'I beg your pardon, sir,' says I; 'if you please, I'm looking for the dog.'

"'Dog?' says he. 'What dog?'

"'Isn't it a dog, sir?'

"'Isn't what a dog?'

"'That's to be taken care of, sir; that bites?'

"'No, Copperfield,' says he gravely, 'that's not a dog. That's a boy. My instructions are, Copperfield, to put this placard on your back. I am sorry to make such a beginning with you, but I must do it.'

"With that he took me down, and tied the placard, which was neatly constructed for the purpose, on my shoulders like a knapsack; and wherever I went afterwards I had the consolation of carrying it. What I suffered from that placard nobody can imagine."

THE BOYS TEASE DAVID ABOUT HIS PLACARD, BUT HE FINDS A CHUM

Here was, indeed, a terrible beginning to David's schooldays—for he was a sensitive boy, and no punishment could have equaled in its brutal effect this arranged by Mr. Murdstone. The lad spent many miserable days in terror of what would happen when the school term began again and the other scholars came to find him a subject of mockery and mirth. But when they did come, their taunts of "Lie down, sir!" and "Towzer!" were hardly worse than the fears of his loneliness. Besides, handsome James Steerforth, the head-boy of the school, speedily made a friend of David, and very readily spent for him the seven shillings which had been given to David by his mother and Peggotty.

Steerforth certainly made the little fellow's life pleasanter than it could otherwise have been, and David Copperfield conceived a great admiration for him, which Steerforth seemed to return

in some degree of affection for his little friend. They read stories together, and really made the best of a very uncomfortable and ill-kept school. But Steerforth, who was much older than the other boys, and had great influence with the despicable Creakle, abused his power by picking a quarrel with poor Mr. Mell, the result of which was the discharge of that ill-used tutor. Even this indication that he could be cruel as well as kind did not shake David's faith in Steerforth, and he remained his object of admiration, while with Traddles, another schoolmate, who seemed to be the most unfortunate of little fellows, he was also very friendly.

At the end of six months David was allowed to go home for the holidays, and, to his surprise, he found his mother nursing a baby sister, who had arrived while he was at Salem House. His mother made every effort to appear happy, but even the boy could see she was not happy, and the fact that Mr. Murdstone ordered him about like a dog, and would not let him be friendly with Peggotty, his old nurse, made home almost less endurable than Salem House, to which he was glad to return at the end of his unhappy holidays. But he had only been two months back at school when his mother and her baby died, and David had to make the long journey by coach to Blunderstone to be present at her funeral. The one comfort in all his sorrow was faithful Peggotty, who hated the Murdstones as much as she had loved David and his mother.

Of course, Peggotty got notice to quit the Rookery as soon as David's mother was buried, for Mr. Murdstone and his sister had only allowed her to remain because of her late mistress having had no other servant all her married life. The Murdstones cared so little for David, however, that they had no objection to Peggotty taking him with her for a time to the home of her brother, Mr. Peggotty, on the beach near Yarmouth. This place was known as the Ark, and a quainter home you could not imagine.

It was just an old wooden vessel turned upside down, with a chimney fixed where the keel used to be. David was entirely charmed with it the first time he saw it.



STEERFORTH MAKES TROUBLE FOR POOR MR. MELL AT SALEM HOUSE SCHOOL

"If it had been Aladdin's palace, roc's egg and all, I suppose I could not have been more charmed with the romantic idea of living in it. There was a delightful door cut in the side, and it was roofed in, and there were little windows in it; but the wonderful charm of it was that it was a real boat which had no doubt been upon the water hundreds of times, and which had never been intended to be lived in, on dry land. That was the captivation of it to me. If it had ever been meant to be lived in, I might have thought it small, or inconvenient, or lonely; but never having been designed for any such use, it became a perfect abode.

"It was beautifully clean inside, and as tidy as possible. There was a table, and a Dutch clock, and a chest of drawers, and on the chest of drawers there was a tea-tray with a painting on it of a lady with a parasol, taking a walk with a military-looking child who was trundling a hoop. The tray was kept from tumbling down by a Bible; and the tray, if it had tumbled down, would have smashed a quantity of cups and saucers and a teapot that were grouped around the book. On the walls there were some common colored pictures, framed and glazed, of Scripture subjects. There were some hooks in the beams of the ceiling, the use of which I did not divine then; and some lockers and boxes and conveniences of that sort, which served for seats and eked out the chairs.

"All this I saw in the first glance after I crossed the threshold—child-like, according to my theory—and then Peggotty opened a little door and showed me my bedroom.

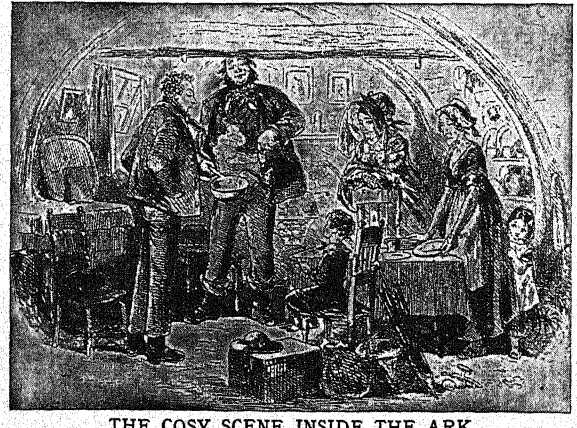
THE INSIDE OF THE ARK AND THE QUAINT FOLK WHO LIVED IN IT

"It was the completest and most desirable bedroom ever seen—in the stern of the vessel; with a little window, where the rudder used to go through; a little looking-glass, just the right height for me, nailed against the wall, and framed with oyster-shells; a little bed, which there was just room enough to get into; and a nosegay of seaweed in a blue mug on the table. The walls were white-washed as white as milk, and the patch-work counterpane made my eyes quite ache with its brightness."



WHAT THE ARK WAS LIKE OUTSIDE
Little Emily on the beach near her home

And the folk that lived at the Ark were as quaint as their abode. First there was Dan'l Peggotty himself, a tall, burly fisherman, whose heart was as soft as his whole appearance was rough; then there was Ham Peggotty, his orphan nephew, the boat-builder, a great burly young man, just as simple-hearted as his uncle; and Mrs. Gummidge, the widow of Mr. Peggotty's former partner in the fishing trade. Mrs. Gummidge seemed to be the most miserable, moping, grumbling woman in the world. She was always lamenting her uselessness, her "lone, lorn" condition, the fact that she was a burden on Mr. Peggotty, but all the while she did the work of the house splendidly, and kept everything neat and clean, and when great sorrow came to them all, Mrs. Gummidge proved herself a woman of courage and a brave heart. Last, but not least, was Little Emily, the daughter of Mr. Peggotty's brother-in-law, who, like the father of Ham, had been "drowndead." Emily was a very beautiful child, and she and David played, rather shyly, perhaps, at being sweethearts. She had a very great love for her uncle, who loved her better than anything else in the world, and yet she was fated to bring to him the greatest sorrow of his life.



THE COSY SCENE INSIDE THE ARK
Here we see Mr. Peggotty, Ham, Clara Peggotty, Mrs. Gummidge, and Little Emily. David Copperfield is seated on a chair.

When Clara Peggotty brought David here among these simple,



DAVID SURPRISES HIS AUNT BETSY
After a walk from London he arrives at Dover.

good people, he was as happy as he could be, and he clung to them all as his only friends, now that his mother was dead. With Emily he attended the very quiet wedding of Clara and Mr. Barkis, the carrier, which took place during his stay at the Ark. Barkis had long wanted Clara Peggotty for his wife, and had really proposed to her through David, by getting him to say to her, " Barkis is willin' ! " meaning that when she was ready to marry he was willing to have her. But she would not have married him if her dear mistress had not died. Barkis had a fine little house ready waiting for her, and one of the bedrooms was to be kept for David whenever he wanted it ; so that he had a home after all, though the horrid Murdstones had usurped the Rookery. Murdstone's main desire was now to be rid of his stepson, and when David returned to Blunderstone, he found that arrangements had been made for him to be employed in the warehouse of the London wine merchants in which Mr. Murdstone had some interest. His wages would be enough, he was told, to buy his food and clothing, and his lodgings and washing would be paid for by his stepfather. So off the boy was packed to London to make his fortune.

The rat-infested warehouse of Murdstone and Grinby's was on the Thames at Blackfriars, and the work which David was given was of the most menial kind. He was sent to lodge with a Mr. Micawber, then living off the City Road, and thus began an acquaintance that was fated to last for many years. Mr. Micawber was an extraordinary man. In appearance he was tall and of good presence, an extremely large bald head rising like a shining egg out of a most imposing shirt-collar. His clothes were like those of a rather shabby actor. And, indeed, Micawber was something of an actor. He loved to speak in long-winded sentences, full of extraordinary words, and he was always on the point of doing something remarkable—which he never did. He was really a failure in everything, and was in debt to everybody, always promising to square accounts when something turned up, but nothing ever " turned up " with him. His wife boasted of her grand relatives, whom nobody ever saw, and made a great show of her shabby fineries. The Micawbers had four children—a boy and a girl, somewhat younger than David, and two infants who were twins.

DAVID IS HAPPY IN THE SHABBY HOME OF THE MICAWBERS

On the whole, David found the shabby home of the Micawbers not too comfortless, but he suffered great misery at the warehouse, where he toiled as no boy of his age and upbringing should have been allowed to toil, among ignorant, rough men and lads. Mr. Micawber got put in prison for debt, but David was faithful to him, and when Mrs. Micawber and her family also removed into the prison—as they could do in those days—a room near



A PEEP INTO THE HOME OF URIAH HEEP
David has gone with Uriah to take tea with him and his mother in their " 'umble " abode, when Mr. Micawber pops in.

to it was hired for their young lodger, who had so great a liking for Micawber that he had no wish to be separated from that good-natured, genial, but hopelessly impracticable person. In the course of time Micawber was liberated again, and with his family set off for Plymouth, where his wife's grand relations were supposed to have great influence, and "something might turn up" if he were on the spot.

HOW DAVID RAN AWAY FROM LONDON AND FOUND HIS AUNT BETSY

David parted from them with sorrow, and soon after decided to run away from the hateful bottling warehouse. He wrote to Mrs. Barkis to lend him half a guinea, and to tell him if she knew where his aunt, Betsy Trotwood, lived. His dear old nurse sent him the money, but could only say that his aunt lived somewhere near Dover or Folkestone way. Even with so vague a destination, David set out, but had not got clear of London before he was robbed of his box and his money; so that he had to suffer terribly before, by dint of much inquiring, he found himself in dirty rags at the door of his aunt's comfortable little house at Dover. The lady was amazed to see the ragged boy, who told her she was his aunt and that his name was David Copperfield. There lived with Miss Trotwood an elderly man named Richard Babley, but better known as "Mr. Dick." He was not quite sane, but Miss Trotwood always declared he had a great deal more sense than he was given credit for, and she often acted upon his advice. She now sent her servant to call him, and asked him what she should do with David.

"Why, if I was you," said Mr. Dick, considering the matter and looking vacantly at David, "I should—I should wash him."

"Janet," said his aunt, "Mr. Dick sets us all right. Heat the bath!"

DAVID'S HAPPY SCHOOLDAYS IN THE OLD TOWN OF CANTERBURY

And so began a new and happy chapter in David's life. Instead of being the sour old woman we might have expected, from her conduct the night David was born, she proved the kindest and best of aunts, and forgave David for being a boy, but made him call himself Trotwood Copperfield in future. He had many happy days with Mr. Dick, whose great trouble was that he could not avoid mentioning King Charles's head in a memorial he was writing out to submit to the Government. King Charles's head would come in somehow, and then he had to begin all over again. But otherwise Mr. Dick was a quiet and interesting old gentleman, who loved to fly large kites, and he got on excellently with David, whose aunt at length decided to send him to Dr. Strong's academy at Canterbury. She made arrangements for him to board at the house of her lawyer there, Mr. Wickfield, whose beautiful and wonderfully intelligent young daughter, Agnes, looked after the house, Mrs. Wickfield being dead.

David was extremely happy here, both at school and at home, and came to regard Agnes as his chum, to whom he could tell his inmost thoughts. The only person he did not like was Mr. Wickfield's clerk, a young man named Uriah Heep, who forced his acquaintance on David, and always pretended to be very humble. "I am well aware," he said, "that I am the 'umblest person going, let the other be where he may. My mother is likewise a very 'umble person." This fellow really hated David because he and Agnes were such warm friends, and the cringing scoundrel was to cause much trouble to that little household later on.

DAVID'S AUNT CHOOSES A PROFESSION FOR HIM AND FITS HIM OUT

The happy days at Canterbury came to an end, and David's aunt furnished him with money to take him to London, or wherever he cared to go, for a time, as a holiday, during which he might consider what his next step in life was to be. He went to London, and there by chance met Steerforth, for whom all his old admiration remained. That breezy, pleasure-seeking young man accompanied him on a visit to the Peggottys, "just for the fun of the thing," as we say. He pretended to be very interested in all he saw at Yarmouth. David, in the meantime, had thought very little about his next step, and a letter from his aunt decided it. By paying a thousand pounds to the firm of Spenlow and Jorkins, she could get him taken as a pupil in a branch of the law which related chiefly to Church matters and marriages. He might become a "proctor," which was a good paying profession. Steer-

forth said it was all right, and David fell in with his aunt's views. When he got back to London, Miss Trotwood made him as cosy as ever a young gentleman was, and engaged most comfortable chambers for him. He soon began to fancy himself quite a young man of fashion, and delighted to entertain Steerforth at his rooms. In his profession he made no great progress; but Mr. Spenlow invited him to his house, and he was at once over head and ears in love with Miss Dora, his employer's motherless daughter, a fragile but bright and lively girl, who also fell in love with him.

Alas! when all seems brightest for our hero, trouble is brewing in many different ways. Uriah Heep gets Mr. Wickfield under his thumb, by preying upon that gentleman's weakness for lingering too long over his wine after dinner, and manages to implicate him in some swindling transactions. Little Emily is to be married to honest Ham, but she runs away with Steerforth, and gloom and mourning descend among the simple folk at Yarmouth. David aspires to marry Dora Spenlow, but suddenly he receives information from his aunt that she has lost all her fortune except the house at Dover, which she has let, and is coming to take up her abode with him in London, while Mr. Dick will get lodgings in the neighborhood. David sees his hope of success as a proctor vanishing, for he can no longer think of going on without earning some money to help his aunt. He cannot get anything of the thousand pounds she paid returned, and presently the firm are proved to be very hard up for money, Mr. Spenlow dying and leaving his daughter unprovided for, instead of an heiress, as most people had supposed. So David has to earn some money as secretary to his old schoolmaster, Dr. Strong, now in London and engaged in compiling a dictionary, while he also learns shorthand and becomes a reporter. Mr. Micawber turns up about this time with great prospects, and invites David and Traddles, who is studying for the Bar, and with whom David has renewed his old friendship, to a little farewell party, at which he makes this speech.



DAVID AND TRADDLES AT MICAWBER'S PARTY.

"My dear Copperfield," said Mr. Micawber, rising with one of his thumbs in each of his waistcoat pockets, "the companion of my youth—if I may be allowed the expression—and my esteemed friend Traddles—if I may be permitted to call him so—will allow me, on the part of Mrs. Micawber, myself, and our offspring, to thank them in the warmest and most uncompromising terms for their good wishes. It may be expected that on the eve of a migration which will consign us to a perfectly new existence"—Mr. Micawber spoke as if they were going five hundred thousand miles—"I should offer a few valedictory remarks to two such friends as I see before me. But all that I have to say in this way, I have said. Whatever station in society I may attain, through the medium of the learned profession of which I am about to become an unworthy member, I shall endeavor not to disgrace, and Mrs. Micawber will be safe to adorn. Under the temporary pressure of pecuniary liabilities, contracted with a view to their immediate liquidation, but remaining unliquidated through a combination of circumstances, I have been under the necessity of assuming a garb from which my natural instincts recoil—I allude to spectacles—and possessing myself of a cognomen to which I can establish no legitimate pretensions. All I have to say on that score is, that the cloud has passed from the dreary scene, and the God of Day is once more high upon the mountain-tops. On Monday next, on the arrival of the four o'clock afternoon coach at Canterbury, my foot will be on my native heath—my name, Micawber!"

All this simply meant that Micawber was going to be clerk to Uriah Heep at Canterbury, for the villain was now the real head of Mr. Wickfield's business, and, with his "'umble" mother, lived in the house, to the distress of poor Agnes.

DAVID MARRIES DORA AND BEGINS TO WIN FAME AS AN AUTHOR

David was still deeply in love with Miss Dora, and as he was now earning quite a good income by writing, and beginning to win fame as an author, he ventured, with the assistance of Traddles, to propose to the aunts with whom she had gone to live that Dora and he should marry. Before long the aunts gave their consent, and they were married. Dora was still little more than a girl, and she was quite unable to keep house properly. Indeed, she was everything that was charming, except a housewife, and David's home was always in a muddle; while poor Dora played with her little dog, Jip. He had the most lovable of wives all the same, and his only sorrow was to notice that her health seemed to grow feeble, the brightness of her eyes to fade, as the months wore on. He had grave fears for her; but his aunt, who had taken a cottage near his own, watched over Dora with as much loving care as if she had been her own daughter.

Meanwhile, things were going badly with Mr. Wickfield, and Agnes was in great distress, when one day the worthy Micawber called, in a very troubled state of mind, to see David and his aunt. On being asked to explain what was the matter, he did so in his own way.

MICAWBER'S GREAT DISCOVERY AND ITS HAPPY RESULTS FOR ALL

"What is the matter? What is *not* the matter? Villainy is the matter; baseness is the matter; deception, fraud, conspiracy are the matter; and the name of the whole atrocious mass is—HEEP!"

He went on at great length to denounce this villain Heep in his own extravagant way, but, to cut his long story short, it all meant that Micawber had discovered the swindling of Uriah Heep, and had set himself to bring honest people to their own. Thanks to him, Miss Trotwood's lost fortune was largely recovered, Mr. Wickfield was restored to happiness, and Mr. Traddles as a young lawyer had a great deal to do in making the old business shipshape again.

Miss Trotwood, out of gratitude for Micawber's service, advanced the money for him and his family to go out and establish themselves in Australia, in the hope that he might find out there the fortune he had vainly expected to "turn up" in England. But the Micawbers did not go alone. In the same boat sailed Mr. Peggotty and Mrs. Gummidge, and with them Emily, whom her uncle still cherished, though she had run away from home and he had to search for her far and wide.

David saw them all sail away, and the night fell darkly on the waters and on him. He next went down to Yarmouth with a letter for Ham, only to be present when the honest young man was drowned in trying to reach a wreck, on which the last man who was washed away was none other than the false friend Steerforth. The shadows were gathering round his own hearth too, for poor Dora gradually faded away, and one day she died peacefully in the arms of Agnes Wickfield.

THE END OF THE LONG STORY AND THE GREAT HAPPINESS THAT CAME AT LAST

David Copperfield, who had known all these sorrows, was still a very young man, with all his life's work before him and his fame as an author steadily growing. He wandered abroad in foreign lands for some years, and when he came back again to England he found his aunt comfortably settled at the old home, with his own old nurse, Peggotty, now a widow, as her companion. Best of all, his spirits began to revive. He found Agnes Wickfield still the same wise, constant woman, and more beautiful than she had been in the dear days when they were young folk together at Canterbury. His aunt managed to show him what he had never before realized, that both he and Agnes loved each other even more than brother and sister, and—so they came to be married!

"I have loved you all my life," said Agnes to David when he had declared his love for her. "And I have one thing more to tell you. On the night that Dora died she left me a last charge. It was that only I should occupy this vacant place."

THE NEXT STORY OF BOOKS IS ON PAGE 2975.



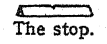
A VIOLIN FROM A CIGAR-BOX

CONTINUED FROM 2812

THE easiest musical instrument to play is the one-stringed violin. If we have what is called "a good ear" for music, if, in fact, we can hum, sing, or whistle an air correctly after having heard it once or twice, we shall soon be able to play a one-stringed violin. We need not study music. We need not even be able to read the notes. We shall simply learn by experience where to put our finger on the string of the violin to get any note we require, and in a very short time, perhaps in a day or two, we shall be able to play simple tunes.



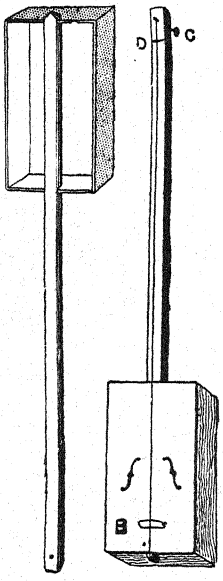
The bridge.



The stop.



The peg.



The picture on the left shows the violin without box-lid and that on the right the complete violin. (A) Cigar-box; (B) bridge; (C) peg; (D) stop.

Occasionally these instruments are to be seen in music shops, but it is so easy to make one that it is really hardly worth while to spend money. We shall make our violin out of a cigar-box. The right size is a box made to hold fifty cigars.

First we must take off all the paper that is stuck round the edges of the box. The easiest way to do this is to scrub it off with a hard nail-brush that has been dipped into boiling water. We must not make the wood wetter than we can help, or it will warp. The lid will now come right off, because it was only the paper that formed the hinge. On this lid we must draw with a pencil the two little figures, something like an S in shape, that are shown in the illustration. We can cut these shapes out with a fret-saw in a few minutes. Let us do it as neatly as we can, for the appearance of our violin depends upon this part being done well.

Now we must get a piece of hard wood about thirty inches long. Walnut or mahogany will do. It should be about three-quarters of an inch wide and half an inch thick. A carpenter will cut a piece to these measurements for a quarter. We should ask him to plane away the sharp edges on one side and leave the others square. Then, when we look at the end of the wood, we shall see that it is shaped like a D; round on one side and flat on the other. Now with a sharp penknife we must cut two notches in the ends of the cigar-box for this piece of wood to fit into. When we have made the notches almost big enough with the knife, we should wrap a piece of sandpaper round the wood that is to fit into them and rub it steadily backwards and forwards in the notches until they are quite smooth. In this way we can fit the wood into them very neatly.

Now glue the wood into the notches, leaving about one inch projecting at one end. Then put a little glue all round the edges of the box and on the wood between the two sides, and fix the lid into its place again. A few tiny brass screws put in carefully round the edge of the lid will make it all quite firm.

Now, about one inch from the end of the long piece of wood, make a hole about one-third of an inch in diameter, and fit into it a small wooden peg shaped like the one shown in the picture.

Your violin is now practically complete. We need only two tiny pieces of some hard wood. One will form what is called the bridge, and the other will be merely a thin strip which is glued close to the peg and is called the "stop." We can cut them out of a boxwood ruler that costs a nickel. The picture shows how they are to be fixed.

Now we must go to a music store and ask for one "A" string for a violin. This will cost ten cents. "A" strings are generally made double the length required for ordinary violins, so they will be just right for ours. We had better tell the

shop people that we want a double-length one, uncut, and they will understand. At the same time we can buy a violin bow. New ones can be bought for a dollar, but often music stores have second-hand ones that will be sold for much less, and these are sometimes better than those that have never been used before.

Before we attempt to fix the string we must cut the little piece of wood that projects from the bottom of the violin to a point. Then we must make the box quite smooth with sandpaper and give it a coat of varnish.

When the varnish is quite hard, take the string and make a loop at one end large enough to slip over the projecting point. Then stretch the string to the other end, make a small hole through the peg, and thread the string through it. Now put the "bridge" into its proper place, as shown in the drawing, and make the string tight by turning the peg. When it is tight, draw the bow across it gently, and if it gives out a clear note, our violin is a success.

Now we shall find that it is possible to amuse ourselves for hours trying to play on it, and we shall be surprised to find how quickly we shall learn to slide our finger up and down the string so as to get the notes we want.

In a very few hours we shall have learned to play something, and then we shall improve every day. Probably we should never learn to play an ordinary violin by ourselves; that is why people say it is such a "difficult" instrument. But this kind which has only one string is the easiest instrument to play that has ever been invented.

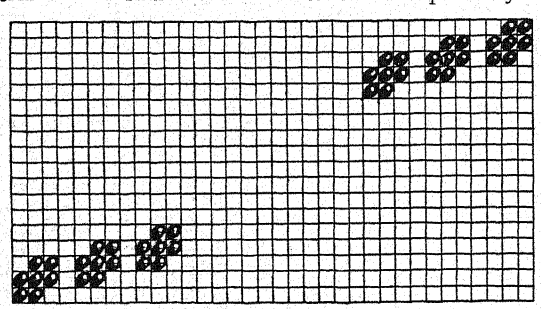
But, although it is easy to learn, we must not think that it does not sound well. When we have practised for some time we shall be delighted with it. Then we can get somebody to accompany us on the piano, and we shall improve rapidly till we have become quite good violinists.

These one-stringed instruments are often played at public concerts, and some performers become well known for the effects they can produce. Most of them play on cigar-box violins that they have made themselves in the manner here described. It must be explained that this instrument is not held like an ordinary violin. The box part is placed between the knees, the string is fingered with the left hand, and the bow is, of course, held in the fingers of the right hand.

A BEAD BELT THAT ANY GIRL CAN MAKE

THERE are three ways of making a bead belt. We can string the beads together somewhat after the method shown on page 2033, without attaching them to any material; we can make the belt on a loom, which sounds very difficult, but is really a good way and very interesting to do; a third way is to sew the beads on to canvas. As the last of these three is quite easy, we are going to follow that way first, and later on find out not only how to use the bead loom, but how to make one for ourselves.

Now for the materials. We shall need a strip of fine canvas, which may be cut from 1½ inches to 2 inches wide, according to the width of belt desired. The length of the strip must, of course, depend on the measurement of the waist.



1. The pattern.

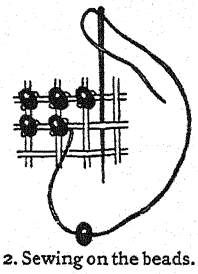
But as we are going to make a particular belt, we decide that it shall measure 21 inches in length and 1½ inches in width. As to the material, Penelope canvas, No. 50, 27 inches wide, is suitable, and a quarter of a yard would make several belts. A fine cream-colored French canvas is also used for bead-work. We shall need a spool of white linen thread, or, better still, some white dental floss. The floss looks better and wears well, provided the beads are good ones and do not cut it. Waxing the thread or floss a little prevents injury. It would never do to have the thread break and the beads drop off the belt. The choice of beads depends much on the pattern to be worked. The opaque Tosca beads would suit our design. They must be evenly formed and of a size to fit the hole or mesh in the canvas. The price is only a few cents a package, and we shall need about six packages of pale blue, one of white, and a few amber crystal beads.

We can buy bead needles by the packet, and we had better try one through the canvas and a bead to see that it is the right size. No. 12 will probably fit. The pretty design which we have chosen for our belt has three white daisies in a row, at intervals of 1 inch between the rows, placed along the edges of the belt, as shown in picture 1. The daisies will go with any shade, therefore the color of the background can match that of the dress with which the belt is to be worn. We will make it pale blue. It is well to cut the canvas about 24 meshes wide, so that three meshes are left for turnings at each edge, and the eighteen meshes between filled with beads. The ends of the canvas must also be cut to allow for turnings; so we make the strip a little longer than 21 inches.

The beads are sewn on to the canvas where the bars cross, and they always lie crosswise on the canvas, or diagonally. We secure the knotted end of the thread or floss

on the wrong side of the canvas, beginning at the left bottom corner of one end. To sew on a bead we thread one, pass the needle down into a mesh, pass it behind and under the cross-bar below and bring it through the mesh, as shown in picture 2. Beads are thus sewn on till the end of the row is reached.

As all the beads must slant in the same direction, when we reach the opposite end of the belt we can either turn the canvas upside down and proceed with the next row of beads, which is the simpler way, or we can run the needle along the back of the canvas, and sew the next row of beads under the last one.



2. Sewing on the beads.

We must look carefully at the pattern to find out where to sew the six white beads for the daisy petals and the amber ones for the centres. To avoid possibility of error, it is well to mark with a pencil the position of the daisies on the canvas, so that we shall know where to replace the blue beads with the white and amber ones.

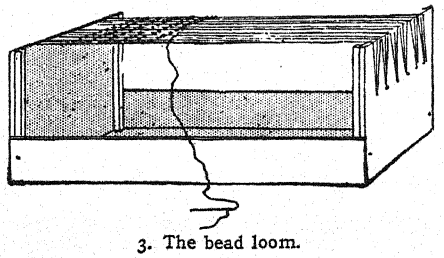
When the beads cover the canvas, we stitch down the turnings and line the belt with sateen to match the blue groundwork beads. Then clasps can be sewn on to the ends. Pretty ones may be had for a very trifling sum.

Small bead-work articles can be made by threading the beads together like a network without using any material for a support, and keeping two needles and threads in use while threading them. The work is then backed to give it a support.

This method is not advisable where a large surface is to be covered. It is somewhat like that of the loom-work now to be described.

A bead loom is not a large machine, but a small and most useful contrivance for making many bead articles. It has long been popular in America, and is getting very well known. We can buy one at a fancy-needlework store in almost all our cities—or we can make one for ourselves out of an oblong wooden cigar-box in the way shown in picture 3. First we take off the lid. Then we cut down the two sides by ruling a line along them one inch from the bottom. After passing a sharp knife several times along the line, the wood will snap off, and the rough edges can be smoothed with sandpaper.

The small strips of wood half an inch square seen from the ends, to match the height of the box, are nailed inside the corners to strengthen the ends. Along the tops of the end pieces we cut little notches one-sixteenth of an inch apart. These are to hold the warp threads, which are stretched across the open box and fastened round six little screw-eyes below in the end pieces of the box.



3. The bead loom.

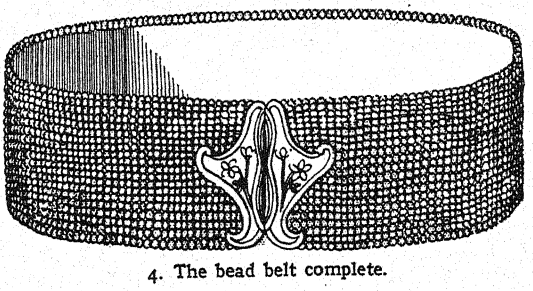
This home-made bead loom will be found useful for all kinds of purposes. A simpler one still can be made by nailing two upright pieces of wood on to a bar, or even by nailing two pieces of perforated cardboard to the wooden frame of a child's slate.

The woof threads should be just two-thirds as coarse as the warp ones. For instance, a warp thread No. 60 would have a woof thread No. 90. A bead needle, size No. 11, and loom beads, about No. 4-0, will be needed.

To make our belt, which, it will be remembered, is eighteen beads wide, we fasten to the loom twenty warp threads about 26 inches long. The two outer ones are to form the edges of the belt.

First we take a needleful of white linen thread and tie it to the left top warp thread, and then thread eighteen beads on to it, according to the pattern.

Now comes the important thing in bead loom-work. We carry the needle with the string of beads *under* the warp thread, so that when the fingers press the beads upward from underneath, they come up through the spaces between the warp threads. To keep them in place we pass the needle through the beads from right to left *over* the warp threads this time. The row of beads is now secure. We proceed with the other rows, picking up the blue, white, or amber beads according to pattern. The woof thread is fastened off by passing it through two or three rows of beads. Having made the belt the desired length, we gather the warp threads into four bundles of five each and tie these up close to the beads. They can be stitched on to a piece of silk or other material, and clasps attached to the two ends of this. The daisies will look best done on bead-work done with the loom, because the beads are placed perpendicularly in threading them, not diagonally, as they are in canvas-work.



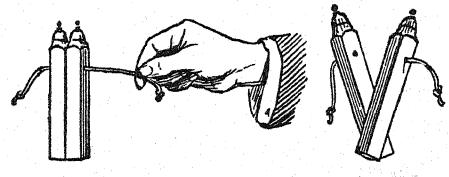
4. The bead belt complete.

Neat little serviette rings are made with canvas bead-work.

Many of the designs of the American Indian women are both quaint and beautiful, and their pretty patterns are worth imitating.

THE PILLARS OF SOLOMON

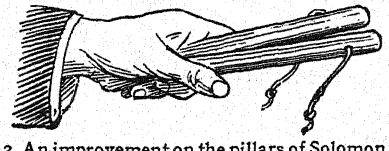
IF the young reader has the good fortune to possess a box of conjuring tricks, we may be pretty sure that one of the items is that known by the imposing title of "The Pillars of Solomon." This consists of two square pieces of mahogany, four inches long, laid side by side as shown in our first picture, with a piece of string running backwards and forwards through a hole near one end of each. There is a knot at each end of the string, and when the cord on either side is pulled, that on the opposite side shortens accordingly. So far, there is nothing surprising. But presently the exhibitor of the trick passes the blade of a knife between the two "pillars." To all appearance the string is thereby cut in halves, and he proves that it is so by moving the pillars slightly apart as in the second picture, and showing the cut ends. And yet, when he brings the pillars back to their original position, one against the other, the string has somehow become one again, and can be pulled backwards and forwards as freely as ever it was before it was apparently cut.



1. The pillars of Solomon. 2.

There is, however, a weak point. The two pillars are pivoted together at the bottom, so that they cannot be separated, and a sharp looker-on soon guesses the secret, which is that the string, instead of passing straight through from side to side as it appears to do, goes down the one pillar and up the other. The supposed cut ends, as shown in the second picture, are mere make-believes, short bits of string artfully glued into the wood.

If the reader has ever been in the East, and visited India, he may have seen the same trick performed by the Indian conjurers, but in a much more surprising way. The "pillars" are in this case two sticks of bamboo. There is here no pretence of cutting the string, but after the conjurer has pulled it backwards and forwards two or three times with the sticks held side by side, he does the same thing with their outer ends held some inches apart. But the sticks are still held together at the bottom, and some clever person is pretty sure to say to his friends, "I know how that's done! The string goes from the one stick to the other at the bottom; you will see that he can't separate them." And he looks round at the company with a superior smile. But the conjurer smiles too, and holds the sticks wide apart, one in each hand. And yet, when he puts them together again, the string is drawn backwards and forwards, as before.



3. An improvement on the pillars of Solomon.

Now, this is really an excellent trick, and it has the additional recommendation that the young conjurer can easily manufacture the needful apparatus for himself. For the "pillars" he must get a couple of straight pieces of elder, about seven or eight inches long and three-quarters of an inch thick. From these he must push out the pith, as if he were going to make pop-guns of them. He must then, with a stout brad-awl, make a little hole through one side of each, about an inch away from what we will call the upper end. Through each of these holes he must pass a thin cord, and, with the help of a piece of wire bent into a hook, draw it down the stick and out at the opposite end. A tiny weight must now be attached to this end of the cord. An easy way to do this is to roll a bit of tinfoil into a hard ball, about half an inch in diameter, make a hole through it, pass the cord through the hole, and make a knot on the under side. A little bit of brass tubing, or a bullet with a hole through it, as sometimes used by fishermen, may be used instead of the tinfoil ball, if more easily obtainable, the test of all being, as it should be, that, if you hold the stick upright, draw the cord up as far as it will go, and then release it, the weight will draw it gently down again.

Having thus weighted one end of the string, you must draw up the opposite end as far as it will go, cut off all but six inches of it, and make another knot on the free end.

There is no real necessity to close the ends of the stick, but you may improve their appearance by pressing a cork into each and finishing off with a little red sealing-wax.

To show the trick, hold the two sticks horizontally in the left hand, as shown in our third picture. The cord in the stick to the left must be drawn out to its fullest extent, but the weight in the other stick must have been previously allowed to run down to the bottom, drawing down the cord and leaving only the upper knot visible. Now slowly pull out the cord on the right, at the same time slightly elevating the upper ends of the two sticks, when the cord in the opposite stick will naturally be shortened, the little weight drawing it down inside. Lower the sticks again to the horizontal position, pass them into the opposite hand, and proceed as before, pulling the left-hand cord and letting the right-hand cord retire into the stick.

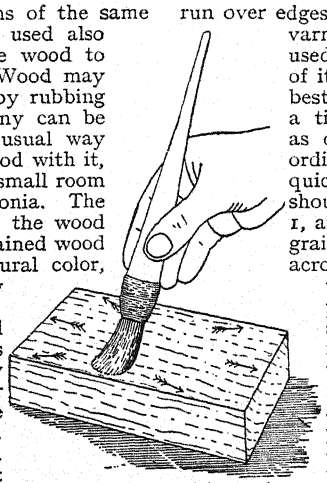
This is the whole of the secret. To cause either cord to shorten, you have merely to tilt the stick so as to make the little weight within it run down into the stick. To lengthen the other cord, you must draw it out with the fingers. But the two movements must be made simultaneously, and it is in the neatness with which they are combined that the magic of the feat consists.

STAINING AND POLISHING WOOD

WOODWORK is stained to improve its natural color. The difference between stain and paint is that stain sinks into the fibres of the wood, and colors or dyes them, but leaves the grain of the wood showing as plainly as before, so that you can still quite easily see what wood it is. Paint forms an opaque coat on the surface which quite conceals the material beneath. Generally stain is used to make a cheap wood look like an expensive one. The colors used are chiefly imitations of walnut, mahogany, rosewood, and other woods. These stains are used on lighter colored common woods, such as common whitewood, pine, and deal, and only for good appearance and not to deceive people, for anyone with a little experience can tell what the wood really is.

Sometimes, though not often, colors quite different from that of any wood, such as green, blue, or red, are used as stains. Very often fancy woods are darkened and improved in appearance by stains of the same color as themselves. Stain is used also to darken lighter parts of the wood to the same shade as the rest. Wood may be darkened in color slightly by rubbing oil into it. Oak and mahogany can be darkened by ammonia. The usual way to do this is not to wet the wood with it, but to shut it up in a case or small room with saucers of liquid ammonia. The fumes of the ammonia darken the wood in a few hours. In all cases stained wood must be darker than the natural color, for a dark surface will show through a lighter stain.

Stains for wood are sold ready for use in small bottles by all dealers. They may be put on with a brush, or rubbed in with a rag. The neater way is to use a brush. Generally two coats are given. With only one coat it is not easy to keep the same shade of color all over, for any overlap with the brush in applying the first coat shows darker than parts over which the brush has passed only once. In succeeding coats this becomes less and less noticeable, so that the best result can be obtained by using weak stain and applying a number of coats, never putting on the next coat until the previous one has become quite dry. The surface must be smoothed with sandpaper before the first coat and after each coat has thoroughly dried. Otherwise it will feel and look rough, for anything which wets the wood causes its surface to roughen as it dries. Varnish stains are often used instead of simple stain. These are varnish and stain combined, and save the trouble of staining and varnishing separately. If done separately, it is necessary that the wood should be stained before it is varnished.



1. How to varnish wood.

VARNISH. Varnish does not conceal the character of the wood beneath it, for it is almost transparent unless something is added to color it. It simply produces, when dry, a hard, glossy film on the surface, which protects the wood from the effects of dampness and from becoming discolored by dirt. Quick-drying varnish consists of shellac dissolved in methylated spirit. The spirit evaporates and leaves a thin layer of shellac on the surface of the wood. Shellac varnish is used only for indoor work. In making varnish for work exposed to the weather it is necessary to use linseed oil instead of spirit, and copal, mastic, amber, or dammar in place of shellac. Varnish may be used either on the bare wood or on paint.

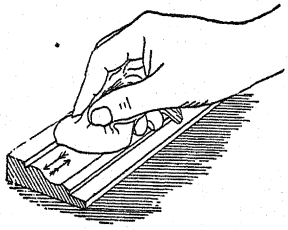
Varnish is applied with a brush. Two or three coats are put on, each being allowed to dry and then smoothed with fine glasspaper before applying the next. For large surfaces a large brush should be used, so that the varnish can be spread quickly. For small work a small brush is better. The varnish should be put on uniformly, so that some parts shall not be more thickly coated than others. Varnish should not be allowed to run over edges or corners of the article being varnished, and the brush should be used so that it does not leave marks of its own all over the work. The best way is to take one surface at a time and cover it with varnish as quickly as possible—that is, if ordinary shellac varnish, which dries quickly, is being used. The brush should be held as shown in picture 1, and should move in line with the grain of the wood. If it is used across the grain, marks of the brush will show more distinctly. To prevent varnish from getting squeezed out of the brush and running over the edges of the wood, the brush should always move outwards to the edges, as indicated by the arrows in picture 1. In approaching the ends of the wood it goes directly to the edges, but in passing along the sides its direction is only very slightly diagonal towards the edges there, so that the movement shall be as nearly as possible in line with the grain. Spirit varnish dries in a few minutes, but to obtain the best results each coat should be allowed several hours to harden before sandpapering it down for the next. After the first coat, old sandpaper which has already been worn smooth by previous use should be employed, and after the final coat the work should not be rubbed down at all. Sandpaper should always be rubbed in line with the grain of the wood. If rubbed across, it scratches the surface too much.

POLISH. The difference between polishing and varnishing is chiefly in the method of application, for shellac varnish and polish are practically the same thing.

The distinction between varnishing and polishing is that varnishing is done with a *brush*, and polishing with a *rag*. Polishing requires more skill and time, but it gives a smoother and glossier surface than varnishing. It is important in polishing that the

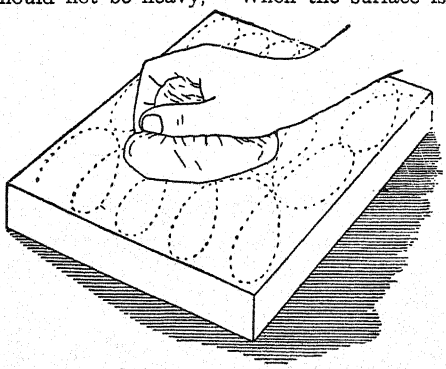
pores of the wood shall first be thoroughly filled, so that the polish cannot sink in and lose its lustre. A number of applications of polish with long intervals for drying will do this, but it is quicker and cheaper to fill the pores with some other substance before beginning to polish. The filler is generally whiting or plaster of Paris dissolved in water, turpentine, or oil, and colored to match the wood. It is rubbed in and allowed to dry, and then the surface is sandpapered smoothly. The wood is now ready to receive the first application of polish.

The rag used in polishing is called a *rubber*. It should be a piece of soft white linen. This is used as an outer covering to a pad of cotton-wool.

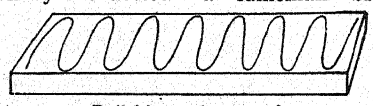


2. Polishing.

The cotton-wool is moistened with polish, and the single thickness of rag encloses it and is drawn up like a pudding-cloth at the top and grasped by the hand while it is used. Picture 2 shows a small rubber held in this way by the thumb and fingers only. Picture 3 shows a larger one. The pressure on the rubber should not be heavy, and a few drops of linseed oil are put on the rag to make it move about freely without tendency to stick. The polish is put on the cotton-wool only, and gets squeezed through the rag in rubbing. The method of rubbing depends to some extent on the shape and size of the work. First, it is necessary to cover the surface of the wood with polish as quickly as possible. This is done by moving the rubber in large sweeps either with or across the grain, or both. The direction is not important as long as the polish is rubbed uniformly all over the surface. On a molding, as in picture 2, the movement would be entirely backward and forward lengthwise. On a large flat surface, as in picture 3, the rubber may be moved in curves or spirals, as shown by the dotted lines. These are only drawn as lines, but the broad surface of the rubber would, in following them, polish the entire area of the wood. On a long surface of moderate width the first movements of the rubber might be as shown in picture 4. For getting into the corners of panels and similar parts the rubber must be squeezed into a pointed form which will reach those parts. After the polish has been applied in this manner, the work must be laid aside for at least a day. Then a second application is given in the same way as the first.



3. Polishing a larger surface.



4. Polishing a long surface.

In the best work this process is repeated a third time or even a fourth, and long periods are allowed between each to allow the polish to sink in as much as it will.

In sinking in, and hardening, it generally loses some of its gloss, and as long as this occurs the work can be improved by fresh applications of polish. This is called *bodying in*. There is now only the final process, which is called *spiriting off*. In spiriting off, the rubber is moistened with wood alcohol instead of polish, and is rubbed lightly over the surface to remove smears caused by the rubber in bodying in, and also to take up the oil, which, when present, gives the surface a dull, greasy appearance. The last movements of the rubber should follow the grain of the wood—that is, the rubber should move in straight lines with the grain, and not across or in curves.

LACQUER. This is used chiefly for coating polished metal to prevent rust. It is more generally used on brass than on any other metal. Brass does not rust, but soon turns dark and dull if unprotected by lacquer. Before applying lacquer the surface of the metal should be made as bright as possible. When the surface is not bright it is because it has a lot of little depressions and lumps, too small to be seen, but their effect is to refract the light in many different directions. When a surface is absolutely smooth all its parts receive and reflect the light in the same direction, and a shiny appearance is the result.

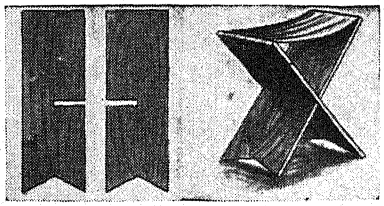
This shiny appearance can be preserved for a long time by protecting the metal with lacquer. In time the lacquer wears off from the parts of an article that are constantly handled, or in the course of years it becomes pitted and cracked by the action of the air, which eventually gets at the metal beneath. Until this happens the metal remains as bright as when the lacquer was put on. Lacquer is sold in small bottles and is applied with a camelhair brush. It may be obtained either colorless or colored. It is sold in all the primary colors, and these can be varied by mixing. The remarks about the use of the brush in varnishing apply to lacquering also, but in lacquering extra care must be taken to put it on free from dust and air-bubbles, for these allow the air to get at the metal.

When the heating of the metal was a necessary part of the process, lacquering was attended with considerable difficulty, but new and improved methods have made it quite a simple matter. Formerly the lacquers used were practically the same as the varnish which we use on wood, but they are now of a metallic character and are very much better adapted for their purpose.

A PORTABLE STOOL THAT A BOY CAN MAKE

ANY boy can make a simple camp-chair out of two pieces of wood and a small strip of canvas or carpet.

The wood should be ordinary planking, about half an inch thick, twenty-four or twenty-six inches long, and of a suitable width. Half-way up each piece we cut a rectangular slot, as shown in the picture, using for this purpose a sharp saw and a chisel, or a fret-saw. Then, at the bottom of each piece of wood, we saw out a wedge-shaped piece, so as to leave feet upon which the chair or stool can stand securely.



We provide the seat by nailing the canvas or carpet to the wood. The material should be about twelve inches long, and one end is nailed to the top of one piece of wood, and the other end to the other chair-leg. In doing this it is well to turn in the edge of the canvas, and to use large-headed nails. The chair is now ready for use. All that we need do to set it up firmly on the ground is to fit the two slots to one another, allowing the legs to open as wide as the canvas or carpet will allow them.

The wood may be stained or colored, and the camp-stool would make quite a nice present. In order that it may look neat when finished, it is important that the slots should be sawn at a point exactly half-way up the pieces of wood, and that they should extend half-way through the width of the planking. Then, when the two legs are fitted together, each will fit exactly into the other. For folding up, the legs are disengaged and placed side by side.

ANSWERS TO THE GAME OF "WHAT-IS-ITS-NAME?"

ON page 2812 are some descriptions of animals, and we have to guess their names from the descriptions that are given.

These are the names of the different creatures:

1. Spider.
2. Tortoise.
3. Giraffe.
4. Amœba.
5. Bat.
6. Porpoise.

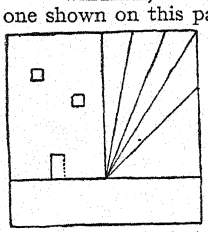
THE SOLUTION TO THE PUZZLE OF THE SECRET LOCK

WE read on page 2806 how a rich man, who wished to preserve his valuable vessels safely, made a safe and fastened it securely with a lock which would only open when three pointers on three dials pointed to three different letters which formed an English word. Knowing this, we thought that it might be possible to find out the word, and this is the way the word can be thought out.

Every English word must have at least one vowel, or otherwise we could not pronounce it. When we look at the dials we find that the only vowel that appears on them is the letter Y, and therefore we know that this letter comes into our word. No English word begins with a Y and has the two following letters consonants. Also, all the words of three letters which begin with two consonants either begin with an S or have H, L, or R as their second letter. But these four consonants do not appear on the dials. Therefore, Y must be the middle letter of our word, and going very carefully through the consonants on both dials and placing them before and after Y, the only word which is made is "pyx," which is the name of a little vessel used for religious purposes.

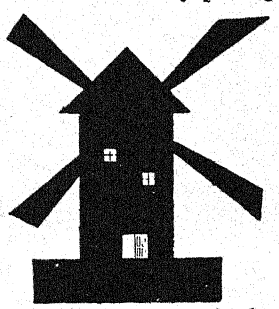
A WINDMILL FROM A SQUARE OF PAPER

WE can make an excellent picture of a windmill, with its sails all set, like the one shown on this page, by simply cutting up a square of black paper into ten pieces and pasting them down upon a sheet of cardboard.



1. The paper marked ready for cutting.

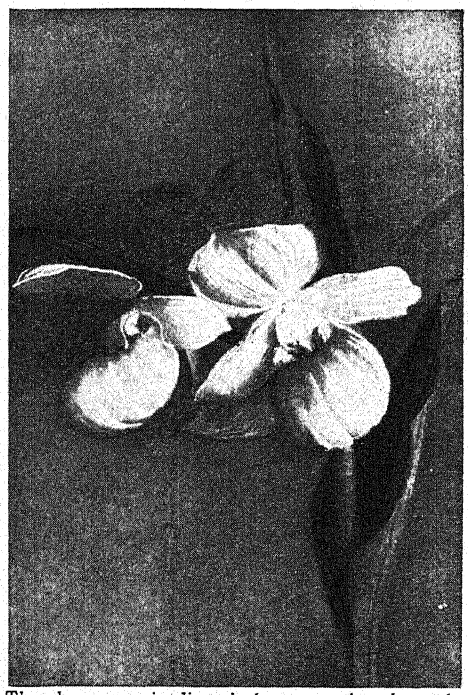
We take a piece of black paper such as may be bought at any stationer's shop, measure off a square, and, placing it upon the table with the white side uppermost, rule pencil-lines upon it, like those shown in the first picture. Then, with a sharp penknife, cut the paper up into ten pieces as marked, and paste these down upon the cardboard in the positions shown. The windows and door are made by pasting the little pieces of paper of which they are formed upon the cardboard, putting the white surface uppermost, and the bars of the window and the panels of the door may be drawn in with pencil. In this way every piece of paper is used up, and we have quite a good picture of a windmill.



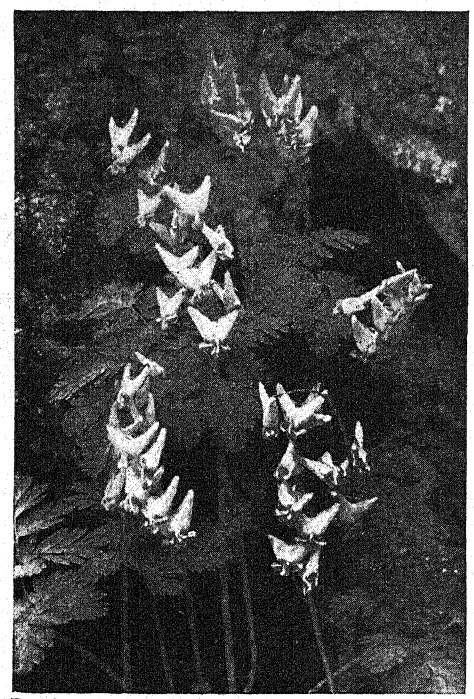
2. The windmill completed.

THE NEXT THINGS TO MAKE AND THINGS TO DO ARE ON PAGE 2993.

CANADIAN FLOWERS



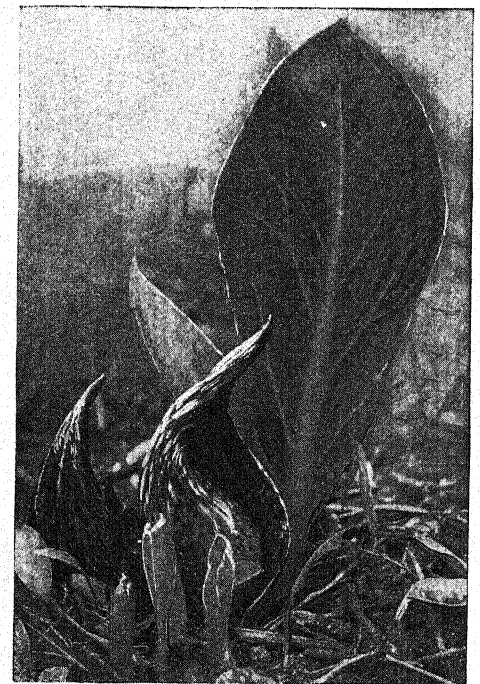
The showy cypripedium is by many thought to be the most beautiful of the lady's slippers. Its large, white flowers bloom in June and July.



Dutchman's breeches is an April flower. Its lovely heart-shaped white and yellow flowers spring from clefts in rocky cliffs. It has thrice compound leaves.



The large white trillium shown in this picture is the most beautiful of the trillium family. It fills the northern woods with its starry white blossoms in May. Farther south the blossoms come earlier.



The flowers of the skunk cabbage make their appearance before the green leaves. They are hidden by a purplish spathe that curls round them. The plant has an unpleasant odor which gives it its name.

WHAT THIS STORY TELLS US

FEW countries have more wild flowers than Canada, as over four thousand have been identified. So this article can tell you of only a few of them, but among these are some of the most beautiful. They grow in the woods, along the roadside by the streams, in the marshes, and in the open fields. Some of these which grow in the fields, though beautiful, have become pests which the farmer would like to see destroyed. Perhaps we shall be able to give you an article on these "weeds," so-called, for often a weed is only a flower out of place. Dr. Hamilton has told the story of the flowers so well that you will be able to name many that you find on your rambles round the country-side.

WILD FLOWERS OF CANADA

PART I

CONTINUED FROM 2785

"FLOWER in the crannied wall,
I pluck you out of the crannies,
Hold you here, root and all, in my hand,
Little flower, but if I could understand
What you are, root and all, and all in all,
I should know what god and man is."
— TENNYSON.

Spring begins, says Burroughs, "when the partridge drums, when the hyla peeps, when the shad starts up the rivers and the grass greens in the spring runs; and it ends when the leaves are unfolding and the last snowflake dissolves in mid air."

Nearly four thousand flowering plants have been found in Canada. Of those, only the most common ones will be described. Fortunately plants occur in families and show striking family characteristics. This helps us much in our desire to know by name our floral neighbors.

LOOK UP FOR THE FIRST FLOWERS TO THE FOREST TREES

In the spring the motto of all flower-lovers should be, "Look thou not down, but up," for the trees are the first to present their flowers. Long before the snow has disappeared, the "pussies" on the willows have burst their purplish-brown winter jackets and presented their velvety gray catkins, which form a charming contrast to the reddish twigs. Some gray catkins become yellow, and bear the pollen, which is carried to the silvery-green pistillate catkins by wind and insects. The pistillate catkins remain after the leaves of the tree have unfolded, and ripen their seeds, which are carried away by wind.

The Poplars belong to the Willow family, and, like the Willows, send out gray, downy tassels before the leaves open. Birches also bear catkins, which appear in the early spring. Birch catkins are very pretty. They are long, graceful, of a silky softness, and with a rich golden color.

THE RED BLOSSOMS OF CANADA'S OWN MAPLE-TREE

Most Maples blossom early. Even in April, the Red Maple is covered with tiny red blossoms. These, with the red twigs, give the tree a striking appearance, in contrast with the white snow which may not have disappeared. The Silver Maple has yellow flowers, and the Rock or Sugar Maple, the national tree of Canada, sends out greenish-yellow flowers, on slender hairy stalks, in graceful, drooping clusters, appearing a short time after the leaves have unfolded. The Basswood or American Linden blossoms in May. Its fragrant, honey-bearing flowers appear in clusters, hanging from the centre of a narrow, leaf-like bract. This bract later serves as a float to the round, one-seeded fruit.

The Elm is a popular tree in Canada. It grows to a great height, with

Copyright, 1913, 1918, by M. Perry Mills.

drooping branches, and in general shape is like an inverted cone. For lining streets, and to lend grace to any landscape, it is one of the most charming of our trees. Before the leaves have opened, the flowers, on slender, drooping stalks, fringe the sides of every branch. The fruit is one-seeded, and surrounded by a thin wing, which serves as a float. The fruits drop early, and in June can be gathered in great quantities.

SOME OTHER FLOWERS OF THE FOREST

The Oaks, Beeches and Chestnuts also blossom early. The Horse Chestnut, though not so common as oaks and beeches, has beautiful flowers, which appear during the latter part of May. In winter, each twig ends in a bud one inch or more long, and within the scales of this bud are borne the leaves and flowers of the coming year. When the warmer days of spring come, the resinous scales of the bud drop off and the leaves—tiny, downy, green babies, done up in woolly blankets—appear.

"The Gray Hoss-Chestnut's leetle hands unfold,
Softer'n a baby's be, at three days old."

The white flowers are very attractive, and appear in large, erect clusters, resembling the flower cluster of the common lilac. The native broad-leaved trees of Canada are most beautiful in midsummer, and particularly in their autumn tints of yellow and red, but the charm in early spring is great when

"The saffern swarms swing off from all the willows,
So plumb they look like yaller caterpillars."

THE FIRST FLOWERS OF THE EARLY SPRINGTIME

If one is bold enough to venture into swampy places in the leafless woods in March, he may find the purple-mottled, sharply-pointed spathes of the Skunk Cabbage. The young buds pushed their way upward before the winter set in, and Thoreau advises those afflicted with melancholy to go to the swamps and see the brave spears of Skunk Cabbage already advanced toward a new year. The purplish shell-like leaf that curls about the tiny flowers, which are hidden from view, is not attractive, and the whole plant, as its name implies, possesses an unpleasant odor, so that while we admire its bravery, we shall not be inclined to gather it. The large beet-shaped leaves, which grow to a length of from one to two feet, appear later than the spathe and flowers, and help to mark the wet woods with bright patches of rich foliage. It seems that bears greatly relish this early green, and settlers near Philadelphia gave to the plant the name "bear-weed." One writer remarks that "it must have been a hot morsel, as the juice is acrid, and is said to possess some narcotic power, while that of the root, when chewed, causes the eyesight to grow dim."

THE SWEET-SCENTED TRAILING ARBUTUS, OR MAYFLOWER

Much unlike the Skunk Cabbage, in April or early May the sweet-scented, rosy-lipped Mayflower or Trailing Arbutus appears locally amongst damp and withered leaves, in sheltered hollows, under trees or in little dells. It has been described as:

"Pink, small and punctual,
Aromatic, low."

The stem has rusty hairs, and is prostrate or trailing. The leaves are rounded, heart-shaped at the base and evergreen. The fragrant, pink, waxy flowers are hidden in little clusters beneath the leaves. Because of their delicious fragrance and rich store of honey, the flowers are much sought after by both man and bees. It is claimed that the Mayflower was the first flower to greet the Pilgrims at Plymouth after their fearful winter, and give them a promise of better days to come. Whittier says:

"Yet God be praised! the Pilgrim said
Who saw the blossoms peer
Above the brown leaves, dry and dead,
Behold our Mayflower here!"

OTHER FLOWERS WHICH GLADDEN THE EARLY SPRING DAYS

Coltsfoot is found in April. It is an immigrant from Europe, but is now wild in this country. It has a slender, scaly scape 3 to 18 inches high, which bears a solitary yellow flower-head, that somewhat resembles a dandelion. It has both ray and disk flowers. The leaves appear later than the flowers, are heart-shaped below, lobed and woolly beneath. It is found growing in most ditches and along the banks or in the beds of streams,

where the bees seek it out for the honey from its flowers.

"Soon after the late snow has melted
The Liver-leaf puts forth her sister blooms
Of faintest blue—"

In the woods in early May we may find the fragile-looking, emerald-like flowers of Liver-leaf, more commonly called Hepatica. The flowers are white, pink or blue, and less than one inch broad. Each flower is borne on a fuzzy scape. The leaves are rounded and three-lobed, and the rusty-brown leaves of the previous summer remain over winter, and afford a pleasing background for the delicate flowers.

In April or May we look for the Spring Beauty, which, like Hepatica, opens in the sun and closes in the shade.

"So bashful when I spied her,
So pretty, so ashamed!
So hidden in her leaflets
Lest anybody find."

Though not much "hidden in her leaflets," the flowers of Spring Beauty, which is also called Claytonia, are very pretty. They are white with pink veins, or pink with deeper colored veins, and grow in a loose cluster. Deep down beneath the ground is a small, round swollen stem or tuber, which in early spring develops into a long, slender aerial stem bearing two grass-like leaves opposite to one another. At the top is the loose cluster of flowers. It is found in moist, open woods of Canada and the United States.

BLOODROOT, WHICH THE INDIANS USED TO PAINT THEIR FACES

In April, the curled-up leaf of Bloodroot, wrapped in papery bracts, pushes its firm tip through the brown leaves, and soon presents a white or rose-tinted flower borne on a naked scape. The foliage leaves are round and deeply lobed. The flowers are beautiful, but the snowy petals quickly fall from about their golden centre, and in two or three days the loveliness of the flower is gone. The plant receives its name because of the crimson juice of its rootstock. The red liquid which oozes from the wounded stem when the flower is picked, stains the fingers. The crimson juice was much prized by the Indians for use in decorating their faces and tomahawks, and in some places it was called Red Indian Paint. The plant grows in Eastern Canada. It is a member of the poppy family.

Dutchman's Breeches has thrice-compound leaves, and white and yellow flowers growing in a raceme on a slender scape. Each flower is heart-shaped, with two bracts or small leaves near its base, two scape-like sepals, four somewhat cohering white petals tipped with yellow, and six stamens in two groups. The two outer petals are large, with spreading tips and deep spurs; the two inner are small, with spoon-shaped tips uniting over the anthers and stigma. The underground stem consists of little tubers collected into one mass, which resembles a bulb.

THE PRETTY YELLOW SQUIRREL CORN

Squirrel Corn very much resembles Dutchman's Breeches. Its underground stems bear scattered yellow tubers resembling grains of corn. Its graceful clusters of nodding flowers have the fragrance of hyacinths. Both are found in rich woods.

In April, the seams of rocky cliffs and hillsides begin to whiten with the blossoms of Early Saxifrage. The leaves are clustered at the root. On a scape 4-9 inch high are borne the small, white flowers in clusters. The calyx is five-cleft, and the corolla has five petals, and there are ten stamens. When ripe, the seed-pods have a rich, madder-brown tone, which gives a warm color to the rocky slopes on which the plants grow.

Our seasons vary from year to year, but usually the same flowers are found in blossom at the same time. When you find the Liverwort, you may look for the Bloodroot and the Adder's Tongue, the Trillium, and soon the Spring Beauty, the Anemones, and the Violets. In many places the blue violets cover the ground with a sheet of dainty violet tinge.

A BEAUTIFUL FLOWER WITH TWO UGLY NAMES

The Yellow Adder's Tongue, a member of the Lily family, though often called the Dog-tooth Violet, sends up a one-flowered scape six to nine inches high. Surrounding the scape at its base are two oblong lance-shaped leaves, which are pale-green, mottled with purple and white. The nodding flower, with a perianth of six pale-yellow parts marked with purple, resembles a small lily. The two names which the plant

bears are inappropriate. Mr. Burroughs has suggested "Fawn Lily" or "Trout Lily"—the first name because the two mottled leaves stand up with the erect, startled look of a fawn's ears; the second because of its speckled foliage, and because it appears when the fever for trout fishing seizes many people. It grows in those hollows in the woods, where the early May sunlight filters through the still, leafless branches of the budding trees.

THE WIND-FLOWERS OF THE MAY TIME

Bryant writes:

"... Within the woods,
Whose young and half transparent leaves scarce cast
A shade, gay circles of anemones
Danced on their stalks."

And Whittier tells how these

"... wind-flowers sway
Against the throbbing heart of May."

The Wood Anemone or Wind-flower has a simple, slender stem, three petioled leaves, each with three wedge-shaped leaflets, and a solitary white, pink or purplish flower of four to seven petal-like sepals. Our Wind-flower seems to us an emblem of spring and purity; but to the ancient Persians it was an emblem of sickness, because it was believed that the wind which had passed over a field of anemones was poisoned, and that disease followed in its wake. The Rue Anemone has leaves with rounded leaflets and white or pinkish clustered flowers. The two anemones blossom at the same time, but the Rue Anemone lingers after the Wood Anemone has gone.

THE GAY TRILLIUMS WHICH ADORN THE WOODS

The Trilliums are among the most attractive May flowers. There are three common ones, the White, the Purple and the Painted. The large White Trillium or Wake-robin is without a rival in purity and abundance. It fills rich woods in Eastern Canada, and lends a distinctive charm to the landscape, as its great white stars stand out from shaded wood borders or from the banks of swift-flowing streams. From a stout rootstock arises a stem bearing a whorl of three green leaves. The flower is terminal, and has a calyx of three green sepals, a corolla of three long pointed white petals, six stamens, and a pistil of three stigmas. The ripened fruit is a dark purple berry, ovate and somewhat angled. The flower is beautiful, but without perfume or nectar. Unhappily these beautiful flowers have almost been exterminated in some sections of the country, particularly near large towns. Careless hands pull up the plants, without a thought of seed or root for the flowers of coming years.

The Painted Trillium is not so large and showy. Its three white petals are painted at their base with red stripes. The so-called Purple Trillium has a stout stem, with a whorl of three broadly ovate leaves a short distance below the solitary terminal flower. The calyx consists of three green spreading sepals, and the corolla of three large, lance-shaped, pinkish petals It is a hardy harbinger of spring, but the name Wake-robin which it receives is not appropriate, because the robins have usually been about and on the alert several days before our flower unfurls its crimson signal.

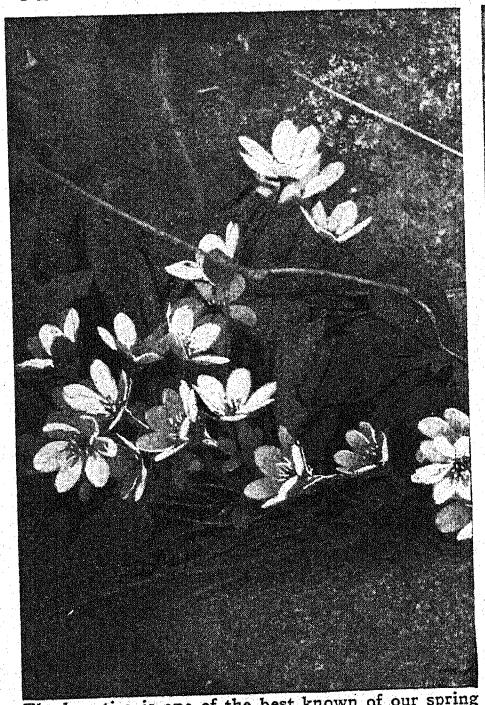
VIOLETS, BLUE, PURPLE, WHITE AND YELLOW

Among the most popular of all spring flowers are the Violets, in yellow, white and blue. Over twenty species have been observed in Canada, and they are found flooding the swamps, fringing the hills and lurking in shady nooks on the hillside, from Atlantic to Pacific. The common Blue Violet, with its slender, one-flowered scape, its heart-shaped leaves, and its pale blue to deep-purple flower, is perhaps the best known and the most beloved of all. The five petals of the corolla are somewhat irregular, and the lower one is spurred at the base.

"... purple violets lurk,
With all the lovely children of the shade."

There are many species of Blue Violets. An interesting feature in connection with violets is that many of them have hidden flowers where self-fertilization takes place, and the seeds are ripened in the dark near or beneath the ground. One species is called the Canada Violet. It has white petals veined with purple and violet beneath. Its delicate flowers are fragrant, and it is among the loveliest of the family. The Sweet White Violet, the most fragrant of the violets, has

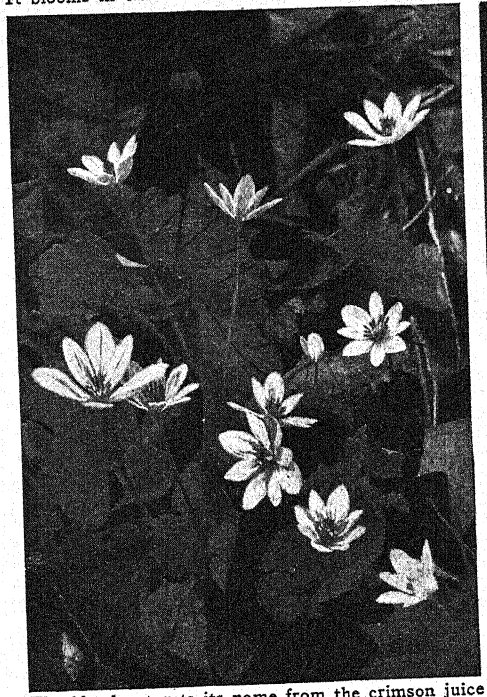
SPRING FLOWERS OF NORTHERN WOODS



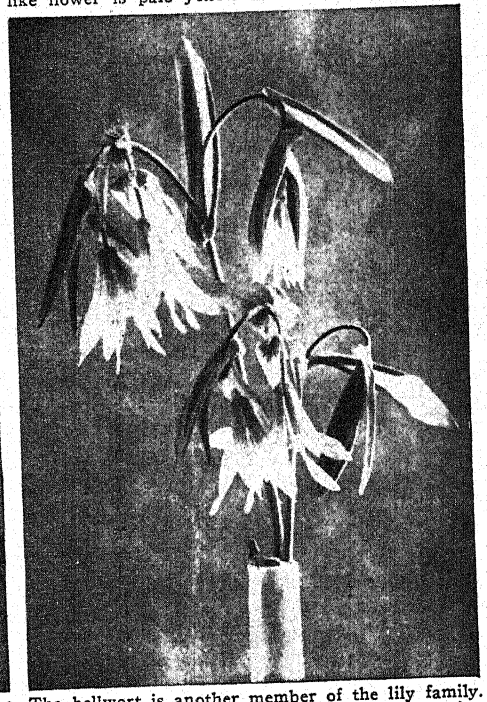
The hepatica is one of the best known of our spring flowers, and one of those that the children love best. It blooms in our Northern woods in early May.



The adder's tongue, which also blooms in early May, is a member of the lily family. Its tall, lily-like flower is pale yellow marked with purple.



The bloodroot gets its name from the crimson juice of its rootstock. It is also called Indian paint, because the Indians used the root juice to paint their faces. The flowers are white or rose-tinted.



The bellwort is another member of the lily family. The leaves of the plant clasp its graceful, curving stem, and under them hang the pale yellow drooping flowers. It flowers abundantly in the spring woods.

small white flowers daintily veined with brownish-purple, and is found in low, wet woods. The Downy Yellow Violet has an erect leafy stem, broadly heart-shaped, toothed leaves, and yellow flowers veined with purple.

"The yellow violet's modest bell
Peeps from the last year's leaves below."

In late April and early May our wet meadows are brightened by the golden-yellow flowers of the Marsh Marigold. This name was given it because the early English settlers in America thought it identical with Shakespeare's "Mary-buds."

"And winking Mary-buds began to ope their golden eyes."

Others, dreaming of home, called it "Cowslip," and that name still clings to it. The leaves are rounded and somewhat kidney-shaped, with several growing from the base of the stem, which is furrowed and hollow, and bears above several flowers which have no corolla. The flower is made up of from five to nine golden-yellow, petal-like sepals, with numerous stamens, and five to ten pistils, which ripen into little seed-pods. The flower produces much pollen and an abundance of honey, and is, therefore, much visited by bees. It is common in all parts of Canada, and it is said to be so abundant along certain English rivers as to cause the ground to look as though paved with gold.

TWO FLOWERS WHICH HAVE BITTER ROOTS

Another dweller in marshy land is Jack-in-the-pulpit or Indian Turnip. There are generally two leaves or long petioles, and each is divided into three leaflets. Terminating a scape is a hood-like leaf or spathe, the pulpit, which is light-green, veined with a deeper tint and stained with purple. Inside the spathe are the small, inconspicuous flowers packed about the lower part of a fleshy spike. The flowers are without calyx or corolla and are of two kinds, the one composed of several united anthers, the other of a single pistil with a bush-like stigma. The two kinds of flowers may be on the same spadix or on different ones. If on the same spadix, the pistillate flowers are at the base and ripen into bright scarlet berries packed upon the spadix. The Indians boiled these scarlet berries and ate them with great relish. Later they discovered that the fleshy bulb-like base of the stem, called a corm, in which is stored the food for next year, lost its stinging taste when cooked, and made nutritious food—hence the name, Indian Turnip. It is a favorite school-boy trick to tempt others to bite into the raw, blistering corm. The impression made on the tongue is not soon removed, and the second bite is not often taken. It is a cousin of the Skunk Cabbage and Sweet Flag, and the Taro Root of the Pacific Islands also belongs to the same family.

The underground stem (rootstock) of Wild Ginger, which sends up its shy, dull purplish-brown solitary flowers in May, has a ginger-like flavor, and by the early settlers was considered a remedy for headache and deafness. It sends up one or two kidney or heart-shaped fuzzy leaves on long stalks, and the tiny flower lies close to the ground on a short stem from the fork of the leaves.

BELLWORT AND STAR FLOWER

Bellwort, a member of the Lily family, is very abundant in the woods in early spring. It has a graceful, curving stem about eight inches high, several lance-oblong, pale leaves set close to or clasping the skin, and beneath the leaves one or two modest, lily-like, yellowish or straw-colored, drooping flowers. It is common in Eastern Canada.

Much resembling the Anemone, but belonging to a different family, is the Star Flower or the Star Anemone. It has a slender, erect stem, bearing at the summit a whorl of from five to ten thin, pointed leaves; and above the whorl of leaves, borne on a short petiole, is a white, delicate star-shaped flower with seven divisions. The whole effect of plant, leaf and blossom, is starry and pointed. The flower secretes no honey, but it is visited by small bees searching for pollen, which is thus transferred from one flower to another and cross-fertilization is brought about.

GOLD-THREAD, A FLOWER OF THE BOG LANDS

A beautiful little plant, whose shining, three-parted, evergreen leaves carpet Canadian bogs throughout the year, is the Gold-thread, which has received its name because of its golden-yellow,

thread-like roots. Its delicate white flowers, with their five to seven club-shaped petals, and numerous stamens, are solitary on slender scapes three to five inches high. The pistil consists of three to seven parts, which ripen into divergent pods, borne on slender stalks, and bearing long, tapering styles. Goldthread is one of the best-known of Canadian wild flowers because of its beauties and its uses. A wash from its bitter, yellow roots is used for ulcerated throats; and the plant is regarded by some people as an excellent tonic. The Indians used the roots to make a yellow dye for their clothes and paint for their faces.

BERRIES, WHICH ARE AS ORNAMENTAL AS FLOWERS

White Baneberry is a common plant in cool, shady nooks near streams from the Atlantic to the Pacific Ocean. The stem is about two feet high, the leaves are twice or thrice-compound with incised and sharply-toothed leaflets, and the flowers are very small, and borne in thick, oblong terminal, feathery clusters. In midsummer, the fruit is a very conspicuous feature of the woods. The flower clusters have given place to a cluster of oval white berries, each with a dark spot on it and each borne on a thick, red stem. The berries are not edible. An earlier species, the Red Baneberry, blossoms a week or two sooner. It produces cherry-red berries borne on slender stems. Curious variations, probably due to intercrossing of the species, are found in the fruits of these plants.

THE WILD COLUMBINE, WHICH LOVES THE ROCKY PLACES

Emerson said:

"A woodland walk,
A quest of river grapes, a mocking thrush,
A wild-rose or rock-loving Columbine,
Salve my worst wounds."

The Wild Columbine is from one to two feet high, with branching stems bearing many, much-divided leaves with lobed leaflets, and large, nodding, attractive flowers of five brightened, petal-like sepals, and five petals in the form of large hollow spurs which are red without and yellow within.

"The graceful Columbine, all blushing red,
Bends to the earth her crown of honey-laden bells."

The flowers contain much nectar, which is eagerly sought by bees and hummingbirds. The many stamens and the long styles of the five pistils project from the flower as a delicate golden fringe. Many species and varieties of Columbine in different colors, such as blue, purple, and white, are cultivated, and these sometimes escape and grow wild in Eastern Canada.

THE FOAM-FLOWER AND THE BISHOP'S CAP, MITERWORT, TRUE AND FALSE

In rocky woods and on hillsides in early spring, the beautiful clusters of Foam-flower or False Miterwort are found. The stem is five to twelve inches high and usually leafless, with one or two heart-shaped, sharply-lobed leaves growing at the base from the underground stem. The foamy-white flowers, each with a five-parted calyx, five petals on claws, and ten long and slender stamens, are borne in a cluster at the top of a slender stem rising about eight inches above the ground. The seed-pod has the form of a bishop's cap or crown, hence the generic or family name tiarella, meaning turban or crown.

In rich woods, but blossoming later than the Foam-flower, is found the true Miterwort or Bishop's Cap. The raceme is more slender and open, and the few flowers are smaller, more delicate and crystal-like. Both species are common in Eastern Canada. Another species of Miterwort, blooming at the same time, and common in swamps from Atlantic to Pacific, has long, slender runners, from which are produced rounded or kidney-shaped leaves with deep, round teeth, and a clothing of soft hair. The flowers are small, greenish, and arranged in a loose cluster at the top of a slender stem.

A PLANT WHICH HAS NEVER GAINED A COMMON NAME

Clintonia borealis, a beautiful plant without a common name, but usually called Clintonia, shows its three or four dark-green, shining leaves sheathing a stem at its base, at all times in summer. In May or June it sends up a scape four to eight inches high, bearing a cluster of drooping greenish-yellow, bell-shaped flowers. Each flower has a perianth of six colored sepals, six protruding stamens and one pistil—a member of the Lily family. Later in the season, the cluster of flowers gives place to a cluster of blue, oval berries, which are beautiful in contrast with the rich green foliage which carpets the woods.

Toothwort is a pretty spring flower common in rich, moist woods. It has other common names, such as Crinkle-root and Pepper-root, descriptive of the pleasant, pungent flavor of its wrinkled, toothed rootstock or underground stem, which is crisp and edible, and used to flavor many a simple luncheon in the cool shadows of the forest. The stem is leafless below, but bears above two leaves each divided into three toothed leaflets. The flowers are white, in a terminal cluster. Each flower has four sepals which drop off early, four white petals, and six stamens, of which two are shorter than the others. These are characteristics of the Cress family, which belongs to the same order as cabbages, stocks and sweet alyssum.

SOLOMON'S SEAL, AND ITS IMITATION

A story of Canadian spring flowers would not be complete without a reference to Solomon's Seal, the blossoms of which appear in May. The stem is slender, curving, and one to two feet long. The leaves are alternate, oval, and set close to the stem. The yellowish, bell-shaped flowers, singly or in twos, nodding from the axils of the leaves, are fastened to a slender flower-stem so fixed into the axil of the leaf that the flowers each droop beneath in a graceful curve, which is sustained in later summer by the dark blue berries. The rootstocks are marked with large, round scars, somewhat resembling the impression of a seal upon wax, and this suggested the common name.

Wild Spikenard, often called False Solomon's Seal, is a handsome and common plant in some localities. It resembles the true Solomon's Seal only in the leafy stem, which is usually curving and one to three feet long. The flowers are greenish-white, small, and in a terminal raceme, at the end of the leafy stem. The leaves are large, oblong, veiny, and clasp the stem alternately. The fruit is a pale red berry, speckled with purple, and the clusters of ripe berries are found in the late summer months.

Another member of the Lily family, which flowers in May and June in moist woods, is the so-called Canada May-flower. It has a cluster of small, white flowers rising just above two clasping, broadly-ovate leaves.

TWISTED STALK AND CELANDINE

The Twisted Stalk somewhat resembles Solomon's Seal, with which it is found blossoming in the woods in May and June. The stem is rather stout and zigzag, and bears taper-pointed, slightly-clasping leaves. The whole plant presents a graceful group of forking branches and pointed leaves; and on picking up a branch one finds beneath each of its outspread leaves one or two slender bent stalks, from which hang the dull purplish-pink, bell-like flowers. In autumn it bears round, red berries.

> "There's a flower that shall be mine,
> 'Tis the little Celandine."

Thus wrote Wordsworth of a plant with golden-yellow, clustered flowers, each with two sepals which fall early, four petals and sixteen or more stamens. The stem is brittle and gives a saffron-colored acrid juice when broken. The leaves are much divided, and the seed-pods are long and slender. Celandine is a European plant now common on roadsides in Eastern Canada. In Europe it is called "Swallow-wort," because it is supposed to commence flowering when the swallows come, and cease when they depart.

THE PRETTY, FEATHERY FLOWER OF THE BUCK-BEAN

In May or early June we are tempted deep into the long grass of a swamp by the beautiful, white flowers of Buck-bean. The flowers are clustered along the upper part of a scape about one foot long. Often they are reddish before opening. The calyx is five-parted, the corolla is five-cleft, funnel-form, and fringed on the upper surface with a white beard, which gives the flowers a beautiful, feathery appearance. The leaves are long-stemmed and each is divided into three oblong leaflets. The Wild Bean or Ground-nut, which blossoms in late summer, belongs to another family, and is a true bean. It has a twining stem, which climbs over bushes in thickets. The leaves are divided into three to seven, narrowly-oval leaflets, and the violet-scented, purplish or chocolate-colored flowers, in close clusters, are shaped like a pea blossom. On its underground stems are many edible enlargements shaped like a pear, which suggested the name Ground-nut.

A PLANT THAT EATS INSECTS

One of the most curious of Canadian plants is the Pitcher Plant, common in peat-bogs and swamps from Atlantic to Pacific. The plant bears, close to the ground, a cluster of hollow, cup-like leaves which are reddish without, and pale green streaked with crimson within. The cups are broadly winged at the side and hooded above. These cups not only attract attention by their peculiar pitcher-like shape and rich markings, but they arouse curiosity because of the trap they set for insects. They are partly lined with a sweet juice, below which, for a short space, they are highly polished; while below the slippery surface there are stiff hairs pointing downward. The cups are usually partly filled with water. Insects are thus easily entrapped and drowned in the water. Thoreau wrote: "Though the moss is comparatively dry, I cannot walk without upsetting the numerous pitchers which are now full of water and so wetting my feet." The name Huntsman's Cup is often given to the plant.

THE FLOWER OF THIS CURIOUS PLANT

The flower of the Pitcher Plant appears in early June, and is not less interesting than the leaves. It is red or dull-purple, large and nodding, and suggests by its form the name "Side Saddle" flower. The five sepals are red or purplish, and each has three brackets at the base. The corolla has five fiddle-shaped, red petals which are arched over the greenish-yellow style. There are numerous stamens, and the pistil has a five-celled ovary with a short style expanding at the top into a five-rayed umbrella, under the angles of which the stigmas are placed. It is thought that the plant absorbs the digested bodies of the insects entrapped, and thus supplements the small supply of nitrogen it receives from the poor soil in which it grows. It is, therefore, an example of a "carnivorous" plant.

THE FLOWERS OF MYSTERY

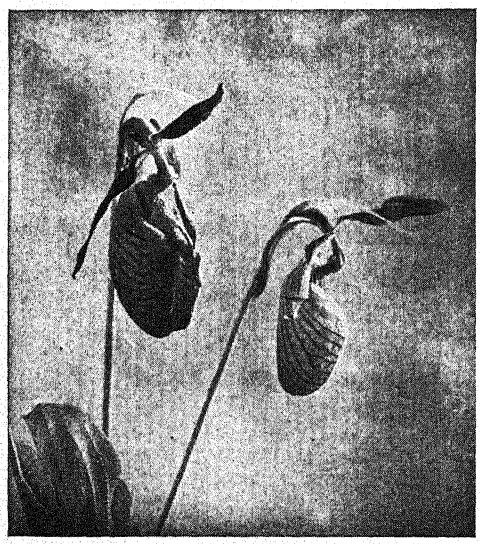
The Orchids are among the most mysterious of wild flowers. About sixty species are found in Canada, but many of them are inconspicuous and rare. A certain fascination attends the very name of Orchid, which suggests visions of tropical regions where, most beautiful and sometimes dangerous, they grow to perfection. "Deep hidden in the damp recess of the leafy woods" throughout Eastern Canada the Showy Orchid appears in May. It has a four-angled stem, with leaf-like bracts, rising from fleshy fibrous roots, two oblong shining leaves four to six inches long, and purple-pink flowers in a loose spike terminating a scape. The flower is very irregular in shape, due to the fact that the base of the perianth is closely attracted to the ovary, and only the upper portion is free. The sepals are colored and petal-like.

One of the petals differs much from the others in form and position and is called the "lip." It serves as a sort of platform on which insects alight. In the Showy Orchid it is white in color and wavy in outline. The other petals and the sepals are pinkish-purple, and united to form a hood which over-arches a column composed of a single stamen closely united with a style and stigma. The tip turns down in such a way as to give bees and other insects easy access to a store of nectar at the inner end of the lip near the base of the column. The fine pollen grains are enclosed in a filmy covering, which is ruptured by the head of the bee. The sticky discs of pollen cling to the bee and are carried to the stigma of another flower. The whole structure of the flower seems admirably adapted to bring about cross-fertilization of flowers by means of bees. After pollination, the flowers quickly wither and the ovary grows into a pod filled with many tiny seeds. All Orchids produce thousands of seeds, but notwithstanding the fact that they seem to possess every natural adaptation to bring about perpetuation of the species, Orchids are never very abundant.

Blossoming at about the same time, another member of the Orchid family, Calypso borealis, is found in cool bogs and damp woods, burying its bulbs and coral-like roots in damp moss. "Even when her sanctuary is discovered Calypso does not always reveal herself. The ground and the fallen tree-trunks are thickly padded with moss and embroidered with trailing vines of snowberry and Linnaea; painted trilliums dot with their white stars the shadows lying under the tangled fragrant branches, the silence of the forest, disturbed only by

the chirr of a squirrel or the sudden jubilance of the oven-bird, envelopes you and seems the proper accompaniment of such an expedition.

"You follow, perhaps, a winding path made by the wild animals among the underbrush, moving slowly, and you easily overlook the dainty blossom, nestling in some soft, damp nook and poised lightly on its stem as if ready to flutter away between your covetous fingers." The plant consists of a single thin, ovate or slightly heart-shaped leaf from a solid bulb, and a variegated pink and yellow flower with a sac-shaped, inflated lip,



THE PINK LADY'S SLIPPER

two-parted and bearded with yellow and pink. The flower is so exquisite that its discoverer named it after an immortal.

THE LADY'S SLIPPERS

The charm of the Lady's Slipper never wanes. There are several species. One of the earliest, the Stemless or Pink Lady's Slipper, is found under hemlocks and pines in early June.

"Graceful and tall the slender, drooping stem,
With two broad leaves below,
Shapely the flower so lightly poised between,
And warm her rosy glow."

There are two large, oval, veiny leaves lying close to the moss and sheathing the base of a scape, eight to twelve inches high, bearing at its top a solitary pink flower with a veiny lip, and inflated pouch. In all species of Cypripedium (Lady's Slipper), the lip is swollen and sac-like, forming a nectary. The column is unlike that of the other Orchids. The single anther, usually present, is sterile, and forms a flap which overhangs the stigma. Two fertile anthers are attached to the under side of the column. The flower is fertilized by the common bumblebee, which forces its way in through the fissure in front. After eating, he takes the easiest way out, towards the base, where he can see two spots of light. As he forces his way out the pollen on his back is rubbed off by the sticky stigma. As he struggles out of the flower an anther, which blocks the passage, clasps its load of pollen on his back, and this is carried to another flower, where the whole process is repeated. Thus cross-pollination of flowers is ensured and self-pollination is rendered impossible. Six other species of Lady's Slippers have been observed in Canada.

The Yellow Lady's Slipper blossoms a few days later than its pink sister. The leaves are alternate, broadly oval, many veined, and plaited. The stem is two feet high, downy, leafy to the top and one to three-flowered. The flower is large, with a pale yellow lip forming an inflated pouch, and two long, narrow, wavy, brownish, lateral petals which give the flower an alert, startled look when surprised in its lonely hiding places. The Showy Lady's Slipper is usually regarded as the most beautiful of all. The flowers are large and white, with the much inflated lip, about two inches long, pink in front. The stem is leafy, one to two feet high, and bears at its summit the solitary blossom. It is found in rich woods during June and July.

Two Yellow Lady's Slippers blossom from May to July. The Small Yellow Lady's Slipper grows in swamps from Ontario to the Rocky Mountains. It bears "golden slippers meet for fairies' feet." The flower is fragrant and graceful, and has a deep-yellow sac and reddish-brown sepals and petals. The Ram's-head Lady's Slipper occurs in cedar and tamarack swamps, but is not common. It bears three or four leaves at the base of a low stem, and a solitary, purplish, drooping flower, with projecting horns and ears, headed by a tuft of wool at the top.

THE NEXT STORY OF CANADA IS ON PAGE 3063.

THE STORY OF PETER PAN

WE all love Peter Pan, the boy who will not grow up. Nobody knows how young he is or how old he is; all that Mr. Barrie, who gave him to the world, knows, is that Peter Pan is ever young, ever happy, ever hopeful. He is the spirit of Youth and Joy, and he was introduced to the world in 1902 by Mr. J. M. Barrie, who found him hiding in the recesses of a marvelous imagination. Mr. Barrie, with his wonderful mind, has given us many books that men and women read with delight, but he will be remembered by children for all time as the man who gave the world Peter Pan. Nearly every year Peter Pan comes to New York, with Wendy and the lost boys, to tell their story in a theatre, and if we want to be very happy we cannot do better than go to this theatre about Christmas-time, when we shall get to love Peter Pan with all our hearts.

HOW PETER FOUND HIS SHADOW

CONTINUED FROM 2759



THERE was once upon a time a little girl named Wendy Moira Angela Darling. She lived in a house with her brothers, John Napoleon Darling and Michael Nicholas Darling. This house was an ordinary house of brick and slates, but one thing about it was quite extraordinary. It contained a Newfoundland dog whose name was Nana, and this dog acted as nurse to the three children.

Nana was so clever that he never allowed the children to put on a flannel nightdress before it was aired at the fire; and he knew how to turn on the hot water when it was bath-time; and however the children might cry that they would *not* be bathed, or that they would *not* go to bed, Nana always insisted that they should.

Now, Mrs. Darling loved Nana, and she had a particular reason for keeping this brave and powerful dog as the children's nurse. One night, on visiting the nursery, she had seen a strange flitting shape moving quickly to and fro in the dim glow of the nightlight. At sight of her this shape rushed to the window. Mrs. Darling darted towards it, and as it sprang into the night she pulled down the window with a bang. The shape escaped; but something fell on the floor at Mrs. Darling's feet. *It was the shadow of this strange, flitting creature.* Mrs. Darling put the shadow in a drawer; but she felt very nervous for the safety of the children. She feared that the shape might come back and do them some dreadful harm. The only comfort she had was the presence of Nana in the nursery. The big dog, she thought, would protect her children from all danger. But one night Mr. Darling was rather cross, and he said it was ridiculous to have a dog for a nurse; and he got so cross at last that he said Nana should sleep in a kennel in the yard. Mrs. Darling pleaded; the children cried; Nana barked. Mr. Darling, however, was extremely cross, and Nana was led away to the yard, moaning and growling.

That night the window was thrust open, and into the room glided and skipped the mysterious shape.

"Where is my shadow?" it cried; while Nana barked furiously outside. "I can't be happy without my shadow. Tinker Bell, Tinker Bell, where is my dear little shadow?"

Instantly a spot of light flicked into the room, and sprang round the walls, and over the ceiling, and down the beds, and across the carpet, making a tinkling sound wherever it flitted and whenever it settled for a moment. This was the fairy Tinker Bell, a little female fairy. She told the Shape where the shadow lay, and soon the drawer was open, the shadow pulled forth, and the Shape skipped round the room with delight, singing, dancing,

laughing in its joy, while Tinker Bell flashed round the room like a luminous butterfly. But, alas! when the Shape tried to make the shadow stick on, it refused, and so all the delight went, and the Shape burst into passionate tears.

Just at this moment Wendy awoke. She was not frightened, and asked the little Shape why it was crying. Then she asked it its name, and the Shape told her that it was Peter Pan. Wendy got needle and thread and stitched the shadow on to Peter Pan, and Peter Pan danced with joy, for wherever he went the shadow followed him on the floor.

Then Peter Pan told Wendy his story. He said that he lived in a place called Never-Never-Land, with a lot of little boys who had all been dropped out of their perambulators by careless nurses; and that they lived with fairies and would never grow up, but for always and always would remain happy boys in this enchanting Never-Never-Land.

He told her that when the first baby laughed, the laughter broke into little pieces, and each little piece became a fairy, and went dancing about the world. But whenever a child says that it does not believe in fairies, then one of the fairies dies. Peter Pan said it was dreadful for a child to say it did not believe in fairies. There was only one other thing that made them sad, he said, and this was the want of a mother; all the boys in Never-Never-Land wanted to have a mother very much indeed. Wendy asked if there was not a little girl among them who could pretend to be their mother; but Peter Pan shook his head and answered that *girls* never dropped out of their perambulators, they were far too clever. This pleased Wendy, and she loved Peter Pan.

"Oh, Wendy," cried Peter, "come and live with us and be our mother!"

The two boys woke up, and Peter Pan said he would teach them all to fly if Wendy would only come and be their mother. All this time Tinker Bell was tinkling angrily, and telling Peter Pan to come away at once. Tinker Bell loved Peter Pan, and was jealous of Wendy.

When the children heard that they could learn to fly, they were quite excited, and immediately began to spring in the air. But every time, they fell and sprawled on the ground, or bumped flat on the beds.

"You must think beautiful thoughts," cried Peter Pan; and, so saying, soared up gracefully into the air, and sailed noiselessly round the room.

Soon the children learned, and all began to fly round the room with cries of delight. Then the windows opened wide, and Peter Pan led the way into the night; and while Tinker Bell tinkled loudly and Nana barked warningly, the children soared towards the stars.

THE LOST BOYS IN NEVER-NEVER-LAND

THE boys in Never-Never-Land were growing anxious about Peter Pan, who was their captain. He seemed to be a long time away, and they were afraid of wolves and pirates. While they were wondering what had happened to Peter, they saw what looked to them like a large white bird in the sky.

As they gazed at it, Tinker Bell suddenly shone on the trees, and, tinkling very loudly, told them that Peter Pan wanted them to shoot this bird at once. So they ran and got bows and arrows, and shot them into the air. Suddenly down fell—what do you think?—poor Wendy with an arrow in her breast. Jealous little Tinker Bell was responsible for this awful deed.

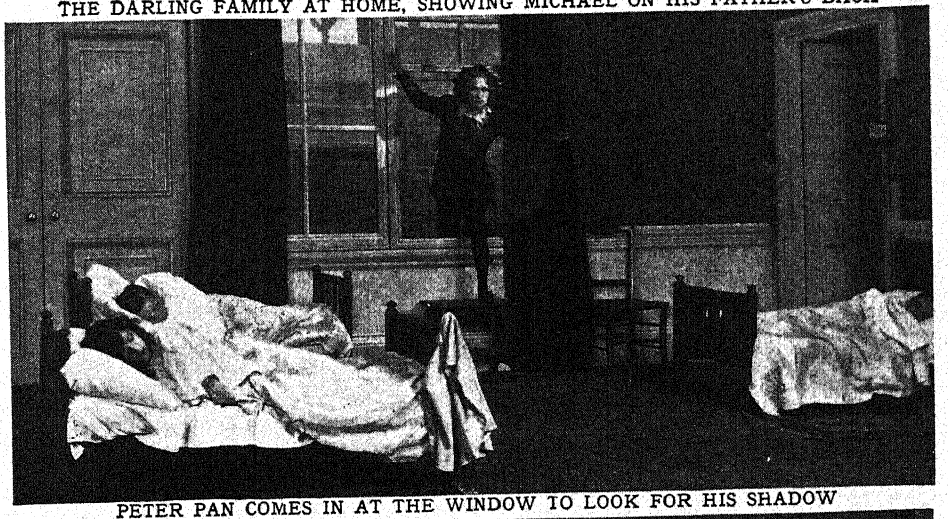
But she was not killed. Soon she revived, and then with her brothers round her, and Peter Pan holding her hand, she promised all the boys to be their mother. Then they set to, and built Wendy a funny little house, with John Napoleon Darling's silk hat for its chimney-pot; and everybody was wonderfully happy, except Tinker Bell, who was more and more jealous of Wendy.

Now, while they were so happy in their house, through the wood came the terrible pirates. The captain of this frightful gang was named Captain James Hook, and a more horrible villain never froze the blood in a child's veins. All his crew feared him and cowered before him. His long black hair was enough to make you shiver; his yellow skin made you go white; his coal-black eyes struck daggers of fear into your heart; but, far worse than all these, more awful even than his cackling laugh and his way of rolling his "r's" so that they sounded like

THE BOY WHO WOULD NOT GROW UP



THE DARLING FAMILY AT HOME, SHOWING MICHAEL ON HIS FATHER'S BACK



PETER PAN COMES IN AT THE WINDOW TO LOOK FOR HIS SHADOW



THE LITTLE HOUSE THAT THE LOST BOYS BUILT FOR WENDY IN THE WOODS

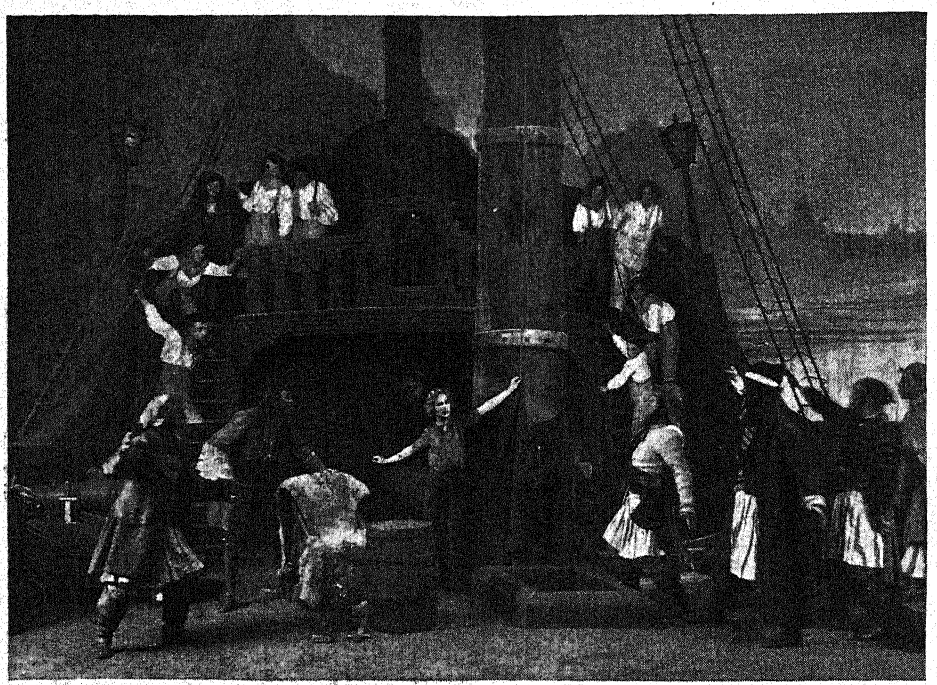
pistols, was his right hand. His right hand wasn't a hand at all, *it was an iron hook*. How he came to have that hook is part of the story.

Peter Pan had tripped the terrible pirate into the sea, and a crocodile, a tremendous *c-r-r-r-r-rocodile*, had snapped off his hand and part of his wrist. Nor was this all. The crocodile enjoyed the captain's hand and wrist so much that it wanted more, and so it haunted the captain wherever he went, longing to eat another bit of him, and dreaming of the happy day when it would gobble him all up. The captain always knew when his ferocious enemy was near because on one occasion it had swallowed an alarm clock, and the ticking of this clock could plainly be heard through its skin. But the captain feared, because he knew the clock would one day run down, and then the crocodile would be able to steal upon him unawares.

You can imagine how this pirate hated Peter, the cause of all his troubles, and how he longed to slay him.

One day, when some friendly Indians were guarding the boys, up came the pirates and made a great slaughter of the poor redskins. The boys did not hear the battle, for they were much interested in something that Wendy was telling them underground.

Wendy, you must know, had become the mother of these boys, and they all did exactly what she told them, and all adored her, because it was so delightful to have a mother after having lived so long without one. After she had seen mermaids and a bird that gave up its nest for Peter Pan to use as a boat, she settled down to be a real, practical mother, giving the boys their medicine, teaching them how to behave nicely, and tucking them all up nice and comfy in their beds. Considering that she was only nine years of age, Wendy made a splendid mother.



PETER PAN SAVES THE CHILDREN FROM THE PIRATES

Well, on this night, Wendy was telling them a story about her own father and mother—a beautiful story which showed how that mother and father must be weeping for their lost children. As she was finishing, John Napoleon and Michael Nicholas sprang up in their beds, and said:

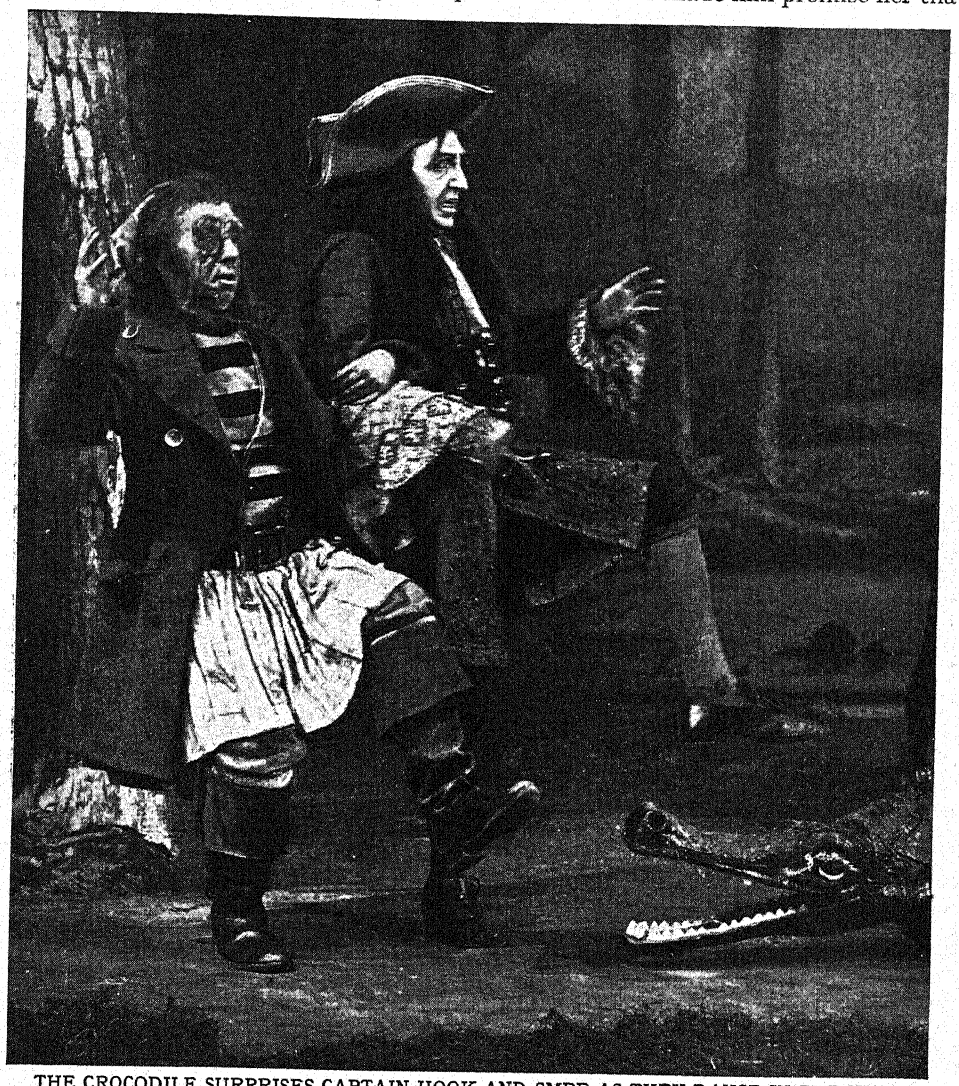
"Wendy, we must go back!"

"Yes," answered Wendy, "we must go back."

You can imagine how dreadfully sad all the motherless boys were when they heard that Wendy was going home.

They cried so much that at last she told them they might come back with her and her brothers, and live in their house, and have Mr. and Mrs. Darling for their father and mother. All the boys accepted this offer with delight except Peter Pan. Peter Pan said he did not want to grow up.

So they all said good-bye to Peter Pan, and one by one went up the narrow tunnel which led from their underground home to the forest and the night. Wendy was the last to go, and before she went she poured out some medicine for Peter and made him promise her that



THE CROCODILE SURPRISES CAPTAIN HOOK AND SMEE AS THEY DANCE IN THE WOOD

He did not want to live in a real house and go to school every day like other boys. He wanted to live always in Never-Never-Land, with the fairies and birds and mermaids. In his heart he was terribly sad at losing Wendy, for whom his love was very great indeed; but he refused to go away and grow up like an ordinary boy.

he would take it when he woke up in the morning.

But instead of kind Indians keeping guard, the pirates were there. The boys were seized one by one as they stepped on ground; a rough hand was clasped over their mouths to prevent them from crying out, and they were carried away prisoners to the pirate ship with Wendy.

HOW THE CHILDREN WENT HOME AGAIN

PETER PAN lay asleep in his bed. The rest of the boys were on board the pirate ship. Peter Pan was alone, and asleep.

Captain Hook was creeping to the hole above. Now was his chance to slay his enemy.

Noiselessly the pirate chief crept down the hole. He arrived at the door, and peeped over the top. Peter Pan was fast asleep. He tried to open the door, and failed. Again and again his hook fumbled at the latch, but failed. Peter Pan was safe. But no! The terrible captain espied the glass of medicine left by Wendy on a shelf; he reached towards it, and then, taking a bottle of poison from his pocket, poured the contents into the glass.

Peter Pan woke up. He remembered his promise to Wendy, and went to drink the poison. At that moment Tinker Bill rushed in, crying:

"Don't drink! Don't drink!"

But her warning was useless.

"I have promised Wendy," answered Peter, and walked towards the glass with his hand outstretched.

In vain did Tinker Bell warn him; but, just as Peter was about to drink, the little Shining Light popped into the glass and drained all its deadly contents. Then it flickered and paled and drooped towards its bed, dying.

Peter knew there was only one way in which he could possibly save it.

"Do you believe in fairies? Oh, please say you believe in fairies!" he cried to all the world. And back from the world, which was so sorry for poor little Tinker Bell, came the answer:

"We believe in fairies."

So Tinker Bell revived and was saved, and she told Peter Pan how the pirates had carried off the lost boys, with Wendy and her brothers, to their ship, and of the danger in which they stood.

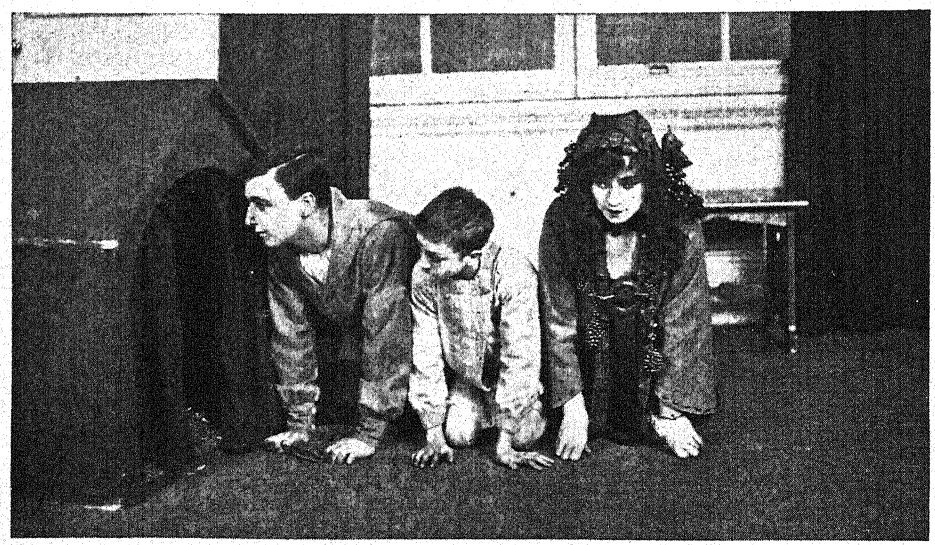
Peter immediately started out. He arrived at the ship just as the captain was going to flog his prisoners before making them walk the plank. Peter Pan had an alarm clock in his pocket; he took it out, and at the first sound of that *tick-tick* the captain gave a great cry of horror, thinking that the cr-r-r-rocodile was near.

During the panic, Peter stole on board ship and hid himself in the cabin where the cat-o'-nine-tails was hidden.

The clock ran down. The captain grew brave again.

"Go and get the cat-o'-nine-tails!" he ordered.

One of the ruffians went to obey. As he entered the cabin a terrible shriek resounded all over the ship. Another pirate was ordered to go and see what



THE CHILDREN COME HOME, AND FIND THEIR FATHER SLEEPING IN NANA'S KENNEL

The photographs of "Peter Pan" are taken by Messrs. Ellis & Walery.

had happened. He, too, uttered a ghastly shriek, and did not come out.

The rest of the crew were now in a state of panic. They refused to enter the cabin; one threw himself into the sea.

Suddenly Peter Pan rushed out, sword in hand, and a terrible fight followed. Captain Hook was flung overboard, where the crocodile was waiting for him; and all the rest of the wicked pirates were killed.

Then Wendy and all the boys went home, and you can imagine how glad Mrs. Darling and Mr. Darling and Nana were to see their lost children. Mr. Darling, we must tell you, had been so repentant for his crossness that he had made Nana live indoors and dine at the table and occupy his own chair; while he himself slept in a kennel outside, and ate all his meals out of a dog's trough. Mrs. Darling had always kept the window open, hoping that the children would return; and used to play and sing "Home, Sweet Home," thinking that they might hear her and come back.

But Peter Pan, all alone in Never-Never-Land, longed for little Wendy; and Mrs. Darling allowed Wendy to go every now and then to visit Peter, and see that his house was nice and tidy. Peter Pan always refused to grow up, and Wendy never forgot the fairies.

THE FABLES OF ÆSOP THE SLAVE

THE LAWYER AND THE PEARS

A LAWYER was once invited to a wedding feast in a house some distance from his own. As he walked along the road, he came across a small basket of ripe pears lying beside the path. He was hungry enough to have eaten them for his breakfast, but was looking forward to the feast and did not want to spoil his appetite; so he gave the pears a kick and sent them into the muddy ditch.

Some distance farther on he had to cross a small river; but it was so swollen by the recent rains that the little footbridge had been washed away, and there was no boat to be seen.

So at last the lawyer had to give up all hope of crossing the stream, and turned back to go home. He was now so hungry that when he came to the muddy pears lying at the bottom of the ditch he was glad to get them out, wipe them as well as he could, and satisfy his hunger with them.

Waste not, want not.

THE DOG AND THE ASS

A LARGE dog and an ass, loaded with bread, were going on a long journey together. Both at last grew very hungry, and the ass stopped to eat the thistles by the roadside. This made the dog feel more hungry still, and he begged for a piece of bread from the donkey's load.

But the ass answered that, if he was hungry, he must find his own food by the wayside, too, for there was no bread to spare.

Just then a wolf was seen in the distance coming towards them. The ass at once began to tremble, and told the dog that he hoped he would stand by him and protect him if the wolf attacked him.

"No," said the dog. "People who eat alone will have to fight alone."

So he left his fellow-traveler to the mercy of the wolf.

If you want to have friends, you must show yourself friendly.

THE HORSE AND THE ASS

A HORSE and an ass were traveling along a road together, with the man who owned them following behind. The horse had nothing on his back; but the ass was so heavily loaded that he could hardly keep moving. So he begged the horse to help him by carrying part of his burden.

The horse was ill-natured and selfish, and refused to do anything to help, with the result that presently the poor donkey fell exhausted in the road and died there. The owner of the two animals tried to relieve the ass, but it was too late. So he took the whole of the burden and laid it upon the horse's back, together with the skin of the dead donkey; and thus the horse, through his selfishness in refusing to do a small kindness, only brought upon himself a great deal of work and trouble.

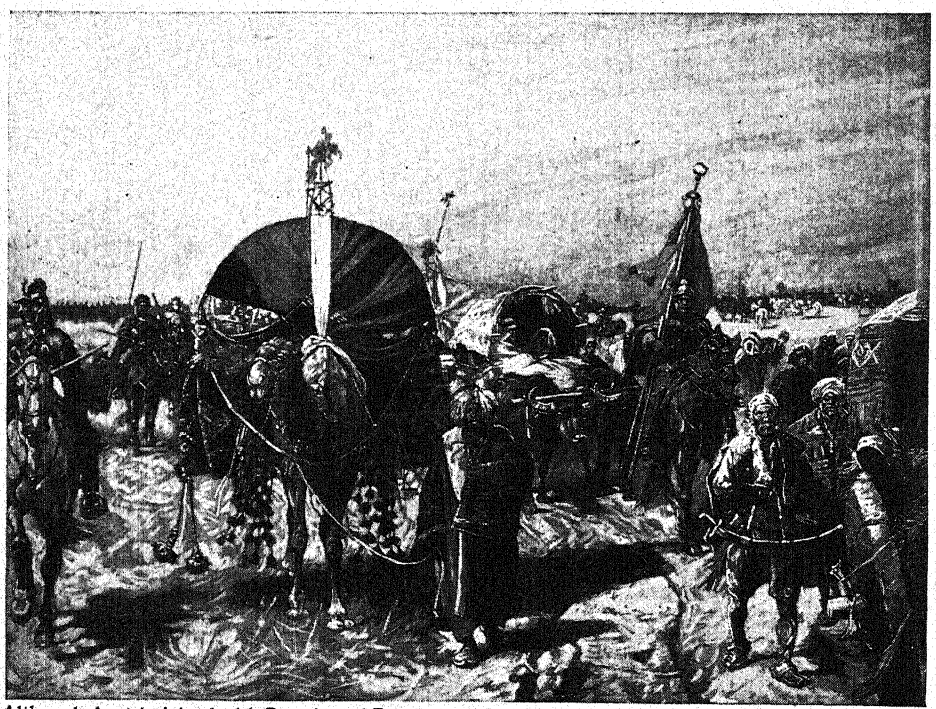
We never gain anything by being selfish and unkind.

THE NEXT STORIES BEGIN ON PAGE 2943.

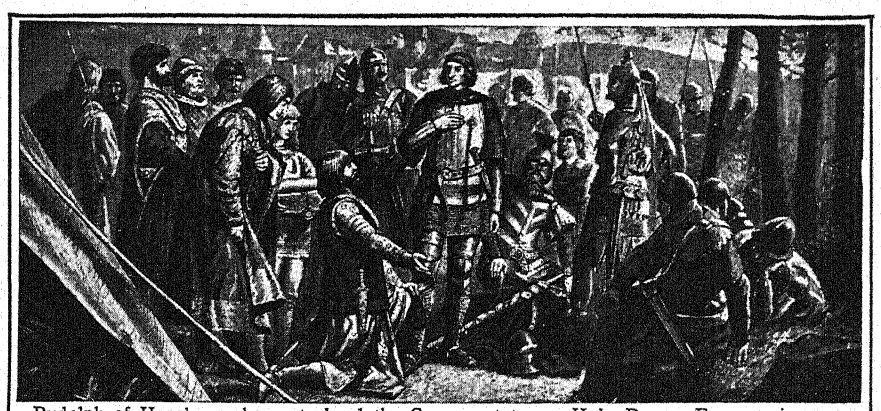
THE FIERCE INVADERS OF AUSTRIA



The Hungarians of to-day are descended from fierce, cruel warriors, who swooped down upon Europe in the ninth century and ruthlessly destroyed everything in their path. After a time these Magyars, as they were called, adopted Christianity, and they are now the most important people in the Austrian Empire.



Although Austria joined with Prussia and Russia in 1772 to divide up the kingdom of Poland, it was only ninety years before that Austria was saved from destruction by the Poles. The Austrian Empire was overrun by a Turkish army, which was on the point of capturing Vienna, when John Sobieski, the king of Poland, appeared on the scene with an army, relieved the capital, and drove the Turks out of the Austrian dominions. Here we see the Polish troops with their prisoners after they had beaten the Turks.



Rudolph of Hapsburg chosen to head the German states as Holy Roman Emperor in 1273

AUSTRIA-HUNGARY, A DUAL MONARCHY

CONTINUED FROM 2772



WHEN the young Emperor Charles of Austria-Hungary succeeded his great-uncle Francis Joseph on the throne, in the last days of the year 1916, he knew that he had a very difficult task before him. The people who live in the dominions over which he rules are of many different nationalities, and of various races, and have never become united as, for instance, the people of France have done. The people of Bohemia, who are Slavs, are of a different race from the Austrians, who are Germans. The Galicians are principally Poles and Ruthenians, and though the inhabitants of Bosnia and Herzgovina are Slavs, they are quite a different people from the Czechs of Bohemia and the Poles of Galicia. The Magyars, who form the majority of the inhabitants of Hungary, are a different race from the people in Austria and Bohemia, and the Rumanians, many of whom live in Transylvania, the eastern part of Hungary, are not related to any of the other peoples.

The Hungarians have a separate government of their own. Austria-Hungary is often spoken of as the Dual Monarchy, and in Hungary, the Emperor is always spoken of as the King. The Hungarians say that the Austrian government has no rights over their country at all, and that the only point of union between the two countries is the fact that they have the same king. It is true that they have only one army and one navy between them, that their postal service is the same, and there is no duty to be paid on goods sent from one country to the other; and that they have only one Minister for Foreign Affairs, but all this is arranged by treaty as between foreign countries, and the treaty must be renewed every ten years. If we can imagine a state of affairs in which the President of the United States should have the right to be governor of Mexico, without choice by the Mexican people, while at the same time the two nations had separate and distinct governments, that will give us some idea of the union between the empire of Austria and the kingdom of Hungary. It is not a very satisfactory one. The proud Austrians claim the right to be looked upon as the senior partners, while the still prouder Hungarians chafe under the idea that they are held subject to a foreign nation.

When the Emperor Francis Joseph

Copyright, 1918, by M. Perry Mills.

died, the new emperor had to go at once to be crowned in Budapest, or as it is sometimes spelled, Buda-Pesth. There, in the Cathedral of St. Mary, he swore to preserve justice and peace throughout the kingdom. With stately ceremony, he was anointed, was invested with St. Stephen's coat, and girded with St. Stephen's iron sword, with which he smote the air, north, south, east and west, in token that he would defend the nation from all its enemies. When he had thus promised to defend the land, he was crowned with St. Stephen's ancient crown, and then and only then did the people of Hungary acclaim him as their king.

Bohemia also was a separate kingdom until it came under the rule of the Hapsburgs when Henry VIII was king in England. The people of Bohemia were, for a time, down-trodden and oppressed, but they still claim that Bohemia is a nation, and that the emperor ought to go to the city of Prague, their ancient capital, to be crowned king.

Ever since men began to travel, and that was very long ago, they have been "going west." Perhaps early man learned the habit by following the sun in its course while daylight lasted, and then resting through the darkness of the night. However that may be, almost all the great peoples of the earth have come out of the east and gone forward toward the setting sun.

THE BEAUTIFUL DANUBE, A GREAT PATHWAY IN EUROPE

Now the great natural pathway, from the east to the west, in Europe, is the River Danube. In our day large steamers carry the commerce of many countries up its broad waters, and railways run along its banks. In times gone by, the Turks found their way along it in their effort to subdue Europe; it was the highway which the Huns followed, when they carried death and destruction into the Roman Empire; the Teuton tribes made their way along its course, and up the hundreds of tributaries that swell the volume of its tide, and, at a still earlier date, it may be that the Celts passed along the same broad road as they pressed forward from Asia to people the rich lands of western Europe. All these people fought to drive back the oncoming hordes. Some were defeated and forced onward, or enslaved; the stronger tribes grew up into nations, some of which were in turn defeated; all of these people intermarried a good deal, and from them are descended the various peoples whom the Austro-Hungarian emperor calls his subjects.

HOW AUSTRIA WAS FOUNDED BY CHARLEMAGNE

When Charlemagne, at the close of the eighth century, was trying to bring under his sway the whole of the western part of the Roman Empire, he saw the danger of leaving unguarded this open road into his dominions, and established a province on the river, near the end of the eastern Alps. This outpost of the empire was called the East Mark, or boundary, and was given to an officer called a margrave to rule with a strong hand. Later it was called the East Reich, or realm, and formed the nucleus of the Austria of our day. After the time of Otto the Great, who drove the Magyars back into Hungary, it became a very important part of the empire. The margraves gradually took for themselves the land to the east, until Upper and Lower Austria reached their present boundaries, and the margraves became strong enough to claim from the emperor the title of duke. The old Roman fortress of Vindobona was made the capital, and grew into the beautiful city of Vienna.

THE COMING OF THE HAPSBURGS TO AUSTRIA

In the thirteenth century, when Rudolph of Hapsburg, a powerful baron of Swiss descent, was chosen emperor by the Germans, Ottokar, king of Bohemia, had succeeded in making himself Duke of Austria, to which Styria and Carniola had already been added. Rudolph, who claimed that these countries were fiefs of the empire, drove Ottokar out and took the Austrian territories for his sons, and from that time on they have been in the possession of his family. Carinthia, Dalmatia, and the beautiful little Alpine country of Tyrol were added to the Hapsburg family possessions. In time they fell by inheritance to the reigning duke, and became provinces of Austria.

Although the Emperor Rudolph was greedy for land and power for his own family, he proved to be a good emperor, for he was strong enough to restore law and order and to keep down the robber barons. He destroyed seventy of their castles in Austria alone, saying that they were not nobles, but "accursed robbers." He was a tall, thin man, nearly seven

AN EMPRESS'S APPEAL TO THE NOBLES



For centuries the sovereigns of Austria looked upon the Hungarians with suspicion, and forbade them to possess arms lest they should rise in insurrection. But when the Empress, Maria Theresa, was attacked by enemies on all sides, and her throne was in danger, she took the bold step of appealing to the Hungarian nobles. Accompanied by her little son, she appeared before them, dressed in mourning and wearing the crown of St. Stephen, the first Christian king of Hungary, and her tears and eloquence moved the nobles to the wildest enthusiasm. Flashing their swords aloft, they declared that they and their sons would die for her.

feet high. He was not a handsome, romantic looking knight, but he had beautiful manners, and so much kindness of heart, that he was loved by every one who came near him, and many stories are told of his bravery. Once, it is said, when he was surrounded in battle and hard-pressed by his opponents, he plunged, full-armored as he was, into a lake and, holding on to the branch of a tree, defended himself until his friends could reach him. Some years after his death, his son Albert became emperor.

After Albert's death there was a gap, during which princes of other states in the empire were chosen as emperors. Then the title went back to the Hapsburgs again, and they were strong enough to keep it, for by marriage and inheritance they gained great possessions.

How an Austrian Duke Became King of Bohemia and Hungary

From the very beginning of their history, there was a constant struggle for the mastery between the Austrians on the one hand, and the Bohemians and Hungarians on the other. In the fifteenth century, when King Matthias of Hungary defeated the Emperor Frederick III and took possession of Vienna, it seemed as though Hungary would get the upper hand. But, after the death of Matthias, Frederick's son, Maximilian I, was able to drive the Hungarians out of Austria. He married his grandson, Ferdinand, to Anna, the daughter of the king of Bohemia and Hungary, and when Anna's only brother died at the battle of Mohacs, Ferdinand claimed both these kingdoms as her right. Maximilian was a very learned prince for his time, and encouraged learning in his dominions. He endeavored to rule wisely, and to make better laws, but he was ambitious of gaining more territory, and his wars brought distress on his own subjects and the empire.

Maximilian's grandson, Charles V, who inherited Spain and the Netherlands, was one of the most powerful of the emperors. These countries are so far distant from Austria, and from each other, that some of us have wondered how they came into his possession, but it is really quite easy to understand. One of Charles' grandmothers was the Duchess of Burgundy, to whom the Netherlands belonged; the other was the great Queen Isabella of Spain, who befriended Columbus. Charles inherited the dominions of both his grandmothers, and he inherited Austria also from his grandfather, the Emperor Maximilian. Charles V, of whose reign we have read in the story of Germany, gave his Austrian dominions to his brother Ferdinand, who had already become king of Bohemia and Hungary through his wife, and so, although Spain and the Netherlands passed to Charles' son Philip, the husband of Queen Mary of England, the Austrian Hapsburgs were still the most powerful princes in the empire.

The Coming of the Magyars into Hungary

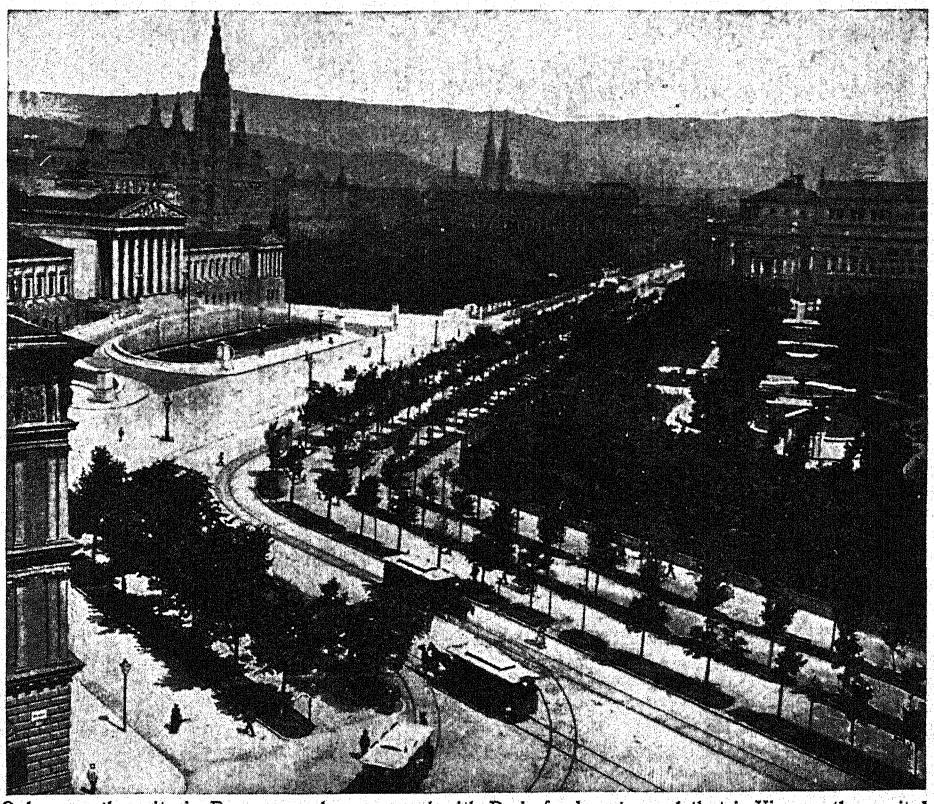
The kingdom of Hungary is composed of the fertile plain which is bounded on the east by the Carpathian mountains, and stretches down, across the Danube to the River Drave. In the time of Charlemagne, the part of the country which lies north of the Danube was called Pannonia and was inhabited by a people called the Avars.

When he dreamed of founding a great empire, Charlemagne marched against these people, overthrew them and ravaged the country. He left it desolate behind him and thus it lay for a hundred years. Meantime, a wild, warlike people named the Magyars, who had made their way westward from Asia across the Volga, were pushed northward by other warring tribes. It is possible that among the Magyars were some of the descendants of Attila's Huns, who had traditions of a beautiful, fertile, mountain-girdled plain which lay beyond the mountains to the west. Fired by these tales, they set out on their hardy little horses, and with their families, their flocks and their herds, they marched to seek the promised land of plenty. Tradition says that the host was composed of seven tribes, ruled by seven dukes, and that these tribes chose Almos, the eldest among them, to be their leader. With Arpad, the son of Almos, at their head, they broke through a pass in the Carpathian mountains, and spread out over the plain below.

St. Stephen, Who Made Hungary a Christian Land

In time they began to adopt European ways, and to listen to the teachings of Christianity, but the majority of the people were still pagans when Stephen, the patron saint of Hungary, began to reign. This great monarch established

THE CAPITALS OF THE AUSTRIAN EMPIRE



* Only one other city in Europe can be compared with Paris for beauty, and that is Vienna, the capital of Austria. Its Prater is the finest park in Europe, and the Ringstrasse, a part of which is shown in this picture, is said to be the most magnificent street in the world. On the left can be seen the Parliament House, just beyond the spires of the Votive Kirche, and further to the right is St. Stephen's Cathedral.



Buda-Pesth, which is made up of the two former cities of Buda and Pesth, divided by the river Danube, is the capital of Hungary and the most important commercial city of the Austrian Empire. The chain bridge shown in the picture, which is the finest of the three bridges that cross the river, is called the Ketten-Brücke. It was designed by an English engineer. It is one of the largest of its kind in Europe.

* Copyright by Underwood & Underwood, N.Y.

the Christian religion in the land, built churches and founded monasteries, and under his influence the greater number of the people were converted. He brought order into the country, laid down laws, and established customs, and the Hungarian people like to trace back to Stephen the foundation of their ancient constitution. Because he had done so much for the cause of Christianity, the Pope conferred on him the title of king, sent him a crown, which is treasured by the nation as one of its most sacred possessions, and also forbade the Emperor to claim Hungary as a fief. Stephen lived in great magnificence, and increased the kingly power so that his successors might not be at the mercy of the great nobles, as other feudal monarchs were.

After his death the nation passed through stormy periods. Some of the kings who followed him tried to encroach on the rights of the people, but in 1222 the nobles and gentry, headed by the king's son, compelled Andrew II, who, like King John of England, was a weak and tyrannous king, to give them a charter. Hungarians are very proud of this charter, which is called the "Golden Bull," and speak of it as their *Magna Carta*. It gave no rights, however, to the serfs, and the nobles used it, long afterward, as a means to keep the peasants from obtaining their freedom. Still the charter showed that the Hungarians were a liberty-loving people, and perhaps the feudal system would gradually have been outgrown if it had not been that a new wave of Asiatic invaders swept up the Danube, and almost engulfed the nation.

THE GREAT HERO, JOHN HUNYADI, AND HIS SON, KING MATTHIAS

These were the Turks, who invaded Europe in the fourteenth century, and were kept from destroying European civilization only by the determined resistance of Hungary. In the fourteenth century, in the reign of Sigismund, king of Bohemia and Hungary, and Holy Roman Emperor, John Hunyadi, one of the greatest of the Hungarian heroes, defeated them again and again. If the European monarchs had come to the aid of this great man, the Turks might then have been driven out of Europe, but, though they made many promises, their promises were not fulfilled. For twenty years, the hero carried on the warfare, almost single-handed, and then, worn out by his labors, he died at Belgrade, from which, with a force of 60,000 untrained peasants, he had just driven back 150,000 Turks.

Two years after his death his son, Matthias Hunyadi, a youth of fifteen, was chosen king, and proved to be one of the greatest monarchs that the country ever had. During his reign the fame of Hungary spread through Europe. He raised a great army which kept the Turks in awe, so that the land was free from terror of their attacks. The Emperor invaded the country twice, but each time he was driven back, and the second time Matthias took Vienna, and lived there for the remaining years of his reign. Matthias encouraged art and science, and invited learned scholars to his court, which was said to be the most brilliant in Europe.

HUNGARY WEAKENED BY STRIFE AND THE KINGDOM LOST

After his strong hand was removed by death, disorder broke out, and in the time of his weak successors, the work that he had done was destroyed. The serfs, whom even Matthias had not thought it necessary to free, rebelled, but the revolt was put down with savage cruelty, and the exactions of the nobles became greater than before. Though they united against the peasants, the nobles fought among themselves. Each sought his own advantage, and while the country was in this state, the Turks again returned to the attack, and Belgrade was taken. Still the nobles would give no aid to the king, who was almost helpless. He had no army, and had no means to pay soldiers even if he had them, for there was no money in the treasury. At last in 1526, when 300,000 Turks swarmed up the Danube, King Louis somehow gathered together a little force of 25,000 men and marched to oppose them. He met them on the field of Mohacs, where his little army was utterly destroyed. He was drowned in a little river as he tried to escape, and his kingdom of Bohemia and part of Hungary passed under the stern rule of the Hapsburg kings.

HOW THE KINGDOM OF BOHEMIA WAS FOUNDED

Long before Charlemagne established the East Mark, a tribe of Slavs named the Czechs settled in Bohemia, the country which lies north of Austria, in the basin of the Elbe. It is a beautiful country, well drained and watered by the Elbe and

AUSTRIAN CITIES AMONG THE MOUNTAINS



The Gulf of Cattaro, under the shadow of the Montenegrin mountains, is one of the finest harbors in the Adriatic Sea, although, from this view, one would think it more conspicuous for beauty of scenery than for commercial usefulness. Great rocks divide the entrance into three separate channels, and two of these are so wide and deep that they will allow the passage of very large ships. The harbor is strongly fortified.



Salzburg, which is almost on the borders of Bavaria, is known as the birthplace of Mozart, the great musical composer. The oldest part of the quaint town is the citadel on the Monk's Hill, which was originally built in the time of the Romans. Salzburg Cathedral is a miniature copy of St. Peter's at Rome.



Cattaro, although a small city with only 5,000 people, has two bishops, with a cathedral, twenty churches, and six convents. At one time it was the capital of a tiny republic. Surrounded on three sides by the high mountains of Montenegro, Cattaro loses two hours of light every day, for the sun rises an hour later and sets an hour earlier than at other places in the same latitude. The city has suffered much from earthquakes.

The photographs on these pages are by the Photocrome Co. and Underwood & Underwood, London.

its tributaries, and is guarded and sheltered by the tree-clad mountains by which it is almost surrounded. Men say that it was once an inland sea, which drained away when its waters broke through the "gates" in the "Iron Mountains" through which the Elbe now makes its way northward to the sea. East of Bohemia lies Moravia, which is watered by the Morawa or March, and northeast of Moravia is the little Silesian province which was left to Maria Theresa when Frederick the Great of Prussia snatched the rest of Silesia away. These three little countries together form the kingdom of Bohemia, which has had perhaps the most unhappy history of any nation in Europe. We know little of the early history of the Bohemians and Moravians except that they established a settled form of government at an early date, and that Charlemagne and his successors tried to subdue them, but with small success.

In the ninth century the Moravians were converted to Christianity largely through the work of two Greek monks, Methodius and his brother Cyril. These men may be said to have laid the foundations of Slav literature, for it was Cyril who invented an alphabet for the Slav language, and translated part of the Bible, a prayer book and some other books, for the use of his converts. At this time the duke of Moravia was much stronger than the duke of Bohemia, but the power of Moravia was broken by the Magyars. It became a fief of the Bohemian dukes and kings, and its story cannot be separated from that of Bohemia.

"GOOD KING WENCESLAUS" WAS A REAL KING

The Bohemians were converted to Christianity, partly by Methodius, and partly by missionaries from Moravia. Their first Christian king was Wenzel or Wenceslaus, of whose gentleness and kindness we sing in one of our favorite Christmas carols. But though we call him "Good King Wenceslaus," and he was a very good man, he was not a good king for those troubled times. He was put to death by his brother, Boleslav, who reigned in his stead, and gave battle to the Magyars, whom he defeated so badly that they gave up all attempt to again invade his country.

Then followed four hundred years during which the story of Bohemia is a long tale of quarrels between rival candidates to the throne, of wars with the Poles and Hungarians and wars with the emperors who constantly strove to force themselves upon the Bohemians as their overlords. In time, however, Bohemia was acknowledged as a kingdom, and although the kings were German electors, the country remained almost quite independent.

In the fourteenth century, Silesia was added to Bohemia by King John, who was killed at the battle of Crecy, while fighting with the French against Edward III of England. He was succeeded by his son Charles, who had already been elected emperor, and is known in German history as Charles IV.

THE GREAT EMPEROR CHARLES IV, ALSO KING OF BOHEMIA

Charles, or Karel as the Bohemians call him, was one of the great monarchs of European history. Like Matthias of Hungary, he encouraged art, science and learning. He invited scholars to his court, and established a university, at Prague, which became a centre to which students flocked from all over Europe. He brought order into the kingdom, and encouraged agriculture and commerce; gave the peasants the right to appeal to the king's court—the highest court of justice in the land—and tried to keep down the power of the nobles, which had become very great. The peasants still, however, had some measure of freedom, and it was not until the next century that they were actually brought into a state of serfdom.

Charles' daughter Anna became the wife of Richard II of England, grandson of Edward III, against whom her grandfather, the blind King John, had fought at Crecy. This marriage led to a great upheaval in Bohemia, for some of the men who escorted the princess to her new home brought back to their own country the books that had been written by John Wycliffe. These books fell into the hands of John Huss, a lecturer at the University of Prague, who is paid by Bohemia the same honor that we give to Chaucer, who, curiously enough, lived at almost the same time.

JOHN HUSS, AND THE BEGINNING OF THE RELIGIOUS WARS

Now Huss, who was a priest as well as a university lecturer, had already been teaching the need for reformation of life.

He adopted some of Wycliffe's doctrines, and as he was a very popular preacher these doctrines soon spread. Many people, however, thought that the effect of his teaching would destroy the authority of both the State and the Church, and he was summoned to defend himself before the Council of Constance, which had been called to heal the Great Schism in the Church, of which we read elsewhere.



Copyright by Underwood & Underwood, N. Y.

The people of the Tyrol are among the most devoted patriots in the world. They have a passionate love for their beautiful country, and have fought bravely to preserve it from the oppressor. They are a simple-minded, devout people, and look very picturesque working in the fields in their quaint national dress.

Sure of his innocence of the charges laid against him, Huss went willingly. But his enemies were too strong for him, and in spite of a safe conduct, or written promise of safety, given him by the Emperor Sigismund, he was condemned and burned, and his ashes cast into the river. His death led to religious wars in which the people fought bravely for liberty of conscience, and for independence and freedom. The forces against them were too strong, however. During the wars the prosperity which Charles had built up was destroyed. The power of the nobles increased, and in the reign of Ladislaus, a Polish prince who had been chosen king of Bohemia, the peasants were reduced to a state of serfdom.

Ladislaus, who had also been made king of Hungary, was succeeded by his only son Louis, the unfortunate king who met his death at the battle of Mohacs. Louis left no children, and Ferdinand of Austria, who was the husband of his only sister Anna, claimed and secured the right to succeed him on the throne.

From this time on the Duke of Austria was also King of Bohemia and Hungary, but although he was entitled King of Hungary, Ferdinand actually ruled over a very small portion of that country. The Turks established themselves in the middle portion; and Hungarian princes succeeded in maintaining Transylvania for a time as an independent principality. Only the northern and western part acknowledged Ferdinand's supremacy, and

it was not until after the famous siege of Vienna in 1683 that the Turks were driven out and the country again united.

THE BEGINNING OF HAPSBURG RULE IN BOHEMIA AND HUNGARY

By this time, the great mass of the people in Bohemia, and a large number in Hungary, had adopted the doctrines of the Reformation, to which the emperors were unalterably opposed, not only because they were devout Roman Catholics, but because they were proud and imperious and tolerated no opinions but their own. From the first they began a series of exactions and oppressive measures in both Bohemia and Hungary. They wished to stamp out the Protestant faith, which to their eyes made their subjects not only heretics but traitors, and to destroy the nationality of both countries and make them dependent provinces of Austria. The Hungarians were almost helpless because they had the Turks among them, but the Bohemians determined to throw off the Austrian yoke. They declared that, by their ancient laws, a king could rule in Bohemia only by the will of the nobles, and on the death of Ferdinand's grandson Matthias, they elected Frederick, the elector of the Rhine Palatinate, to succeed him. This, of course, led to war, and unfortunately Frederick could neither rule nor fight. The Bohemians were badly defeated at the White Hill, outside Prague, by the army of the Emperor Ferdinand III, and Frederick ran away. Then the dreadful Thirty Years War began, which devastated all Germany, and Bohemia was hopelessly crushed.

The same system of repression was carried on in Hungary. One by one the ancient privileges in both countries were taken away. The diets were reduced to helplessness, and German was ordered to be used in the courts of justice, and taught in the higher schools, and the constitutions were taken away. The Bohemian crown was taken to Vienna, but though the Hungarian crown was also taken away, the Hungarians were strong enough to compel it to be given back.

THE PRAGMATIC SANCTION AND THE WARS TO WHICH IT LED

For a long time the imperial title remained with the Hapsburgs, and during this time the history of Austria belongs to the empire. By the eighteenth century, however, the Hapsburg family had almost died out and we read elsewhere of the war which troubled Germany when the last of the Hapsburg kings of Spain left no heirs. The emperor who reigned at this time was Charles VI, who had no son. There was no man left in the family to succeed him, and he therefore drew up a document, called a Pragmatic Sanction, which gave his daughter, Maria Theresa, the same rights of succession to the family possessions as if she had been a son.

We read in the story of Frederick the Great how that monarch took away the province of Silesia, and how the king of France helped the elector of Bavaria to try to gain the Austrian duchies for his own. In her distress Maria Theresa called on the Hungarian nobles for help. They rose as a man in response to her stirring appeal, and the Hungarian army was of great assistance in the wars that followed. Bohemia too was loyal, although the country suffered terribly, for armies marched and countermarched through it and great battles were fought in it, and the people were cruelly robbed by the soldiers on both sides.

HOW THE PROVINCE OF GALICIA BECAME AN AUSTRIAN POSSESSION

Maria Theresa succeeded in retaining her throne. Her husband was made emperor and the young Emperor Charles is descended from their son. Maria Theresa did much for Austria, and under her rule it became more prosperous than it had been for a long time. She built hospitals and schools and encouraged learning, and her rule, like her father's, was so kindly that the people of Bohemia and Hungary were almost contented during her reign. In the last years of her life, she was saddened by the partition of Poland, which she could not prevent. Nevertheless, she did not refuse to take her share of the division and join to her dominions the rich province of Galicia, and so added Poles to the various peoples already subject to her rule.

The Poles are a Slav people who pushed forward into the region of the Vistula and the Oder. They settled down at an early date and about the time that Canute was struggling for possession of the British Isles, their king, Boleslav I, also set out on a career of conquest. Before he died he ruled an immense territory stretching from the Baltic

to the Carpathians and eastward to the Elbe, but his kingdom did not last. After his death it fell into disorder, the people went back into paganism, and some of his provinces were lost.

Nevertheless, the country won its way back into prosperity; the people became Christians, and they seemed to be on their way to become a strong nation. But after this time, century by century, the strength of the nation waned, because it was always a country at strife within itself. Oftentimes the bravery of the people flashed out, as it did when, under John Sobieski, they saved Vienna from the Turks. But gradually the country went down hill. Many of the nobles became little better than half-savage robbers, while the peasants were miserable serfs. Taking advantage of this wretched state of confusion, Frederick the Great, who wanted West Prussia, suggested, in 1772, that Russia, Austria and Prussia should divide a great part of the country between them. The people were too weak to make much resistance and part of the province of Galicia fell to Austria's share. Two other divisions of Poland were made, in the third of which Austria received the rest of Galicia, and in the nineteenth century she took the ancient city of Cracow.

THE WARS WITH NAPOLEON, WHEN VIENNA WAS TWICE CAPTURED

During the wars of Napoleon, Austria, like the rest of Germany, was invaded, and Vienna was captured twice. At this time the ancient title of Holy Roman Empire was given up, and the emperor took the title of Emperor of Austria instead. We read elsewhere of these wars, however, and of the Congress of Vienna which settled the terms of peace, and shall go on to the events that followed.

During the wars, all the nations were roused, and when they were over, men everywhere looked forward to greater freedom. In Hungary, the great patriot Szechenyi made Hungarian the language of the diet. He helped to found the Hungarian Academy of Science and roused interest in public works, trade and commerce.

THE STRUGGLE FOR FREEDOM IN WHICH BRAVE KOSSUTH FAILED

The Austrian rulers tried to destroy these hopes of freedom, but in vain, and in 1848, the forces in the empire became too strong to be any longer held down. Even in Vienna there was an insurrection. The emperor was compelled to grant constitutions to Hungary and Bohemia and finally had to abdicate in favor of his nephew Francis Joseph. Unfortunately some of the patriots in both countries tried to go too fast. An insurrection took place in Prague, and a rebellion broke out in Hungary, under the brave patriot Kossuth, who tried to establish a republic.

The insurrection in Bohemia was easily quelled, and with the help of an army sent by the Russian emperor, the rebellion in Hungary was put down. Kossuth had to flee into exile and both countries lost everything that they had gained, except that the serfs, who had been liberated, retained their freedom. Kossuth came to the United States for a time, but afterward went to Turin, where he lived for the rest of his life.

Meantime the Italian provinces which had been left to Austria by the Congress of Vienna revolted. They were at first defeated, but most of them finally succeeded in obtaining their freedom, and joined the other Italian states in forming the kingdom of Italy.

THE WAR WITH PRUSSIA AND LOSS OF VENETIA

In 1866 Prussia went to war with Austria over a dispute about Schleswig-Holstein. The Austrian armies were defeated, and in the settlement that followed, Austria was shut out of the German Confederation, which afterward became the German Empire. At the same time, in accordance with an agreement made with Prussia, Italy declared war, for the purpose of taking the Venetian province, which Austria still held. As a result of the war this territory was also lost to the Austrian king.

AFTER THE WAR THE HUNGARIANS GAIN SELF-GOVERNMENT

Then, at last, reforms were made in the government. In 1867 Hungary was given complete self-government, and an arrangement called the "Compromise" was made by which it was agreed that the interests which the two countries have in common should be legislated for by a special assembly. This is composed of an equal number of members from each monarchy and is called the *Delegations*. Austria too was given a constitution which, although it does not give the people anything like the freedom to

which we are accustomed, has made life in Austria much more pleasant than it had ever been before.

Bohemia did not fare so well. Little by little the people in that country regained many of their rights. The Bohemian language is taught in all the schools, and in the university. Freedom in religion has been granted to Bohemia, in common with the rest of the empire, and the nation has a form of constitution, and local self-government. They have not, however, been given back the National



This is Charles I, the young emperor of Austria and king of Hungary, who succeeded to the thrones of these countries in December, 1916.

Assembly. Bohemia is one of the seventeen provinces of Austria, and sends a number of members to the imperial diet at Vienna.

How the People of Austria are Governed

The Empire of Austria is composed of seventeen provinces, each of which at one time was a separate little country, and the emperor has separate titles for the greater number. For instance he is Duke of Styria, Duke of Carinthia and so on. Moravia and Silesia came into the empire with Bohemia, but each of them is treated as a separate province. Bosnia and Herzgovina were added to the empire in 1908, but the story of how this was done is told elsewhere.

The laws for the empire are made by the imperial parliament, which is called the *Reichsrat* and is composed of a House of Lords and a House of Representatives, elected by the people every six years. Every man over twenty-four years old is entitled to a vote, and in some of the provinces the men are fined if they do not appear to vote.

Bills must be passed by a majority of the members of both Houses, and approved by the emperor, before they can become law, and as the emperor has the right to appoint a large number of the members of the Upper House for life, and every prince of the imperial family has a seat in the House of Lords, the emperor still has a great deal of power. There are eleven members in the Cabinet which is responsible to the *Reichsrat*. Among them however there is no Minister of Foreign Affairs. There is but one Minister of Foreign Affairs for Austria and Hungary and he is responsible to the *Delegations*.

The Parliament of Hungary, which Meets at Budapest

The Hungarian Parliament, which meets at Budapest, is also composed of two Houses, the House of Lords, called the Table of Magnates, and a Lower House called the Chamber of Deputies, elected by the people, every five years. Suffrage is not universal in Hungary. Only men, over twenty years of age, who pay a small tax, are allowed to vote.

There are ten members in the Cabinet, and the ministry is responsible to the Parliament. Only the province of Croatia-Slavonia has a provincial diet, but the president (called the Ban) has a great deal of power, and is responsible to the Hungarian prime minister.

The last emperor, Francis Joseph, had a long and stormy reign, which began during the rebellions of 1848, and ended in 1916 with the dying year, while the Great War raged around him in Europe. No one else, perhaps, could have held his disunited realms together during these trying times. He gained and held the love of all his people and though Germans and Slavs, Magyars and Rumanians rage at one another, they all loved the kindly old emperor who ruled at Vienna, and looked his troubles bravely and calmly in the face. He outlived his only son by many years, and was succeeded by his great-nephew, who is now the Emperor Charles.

THE NEXT STORY OF ALL COUNTRIES IS ON PAGE 2981.

WHAT THE WISE MAN TELLS US

THE Wise Man tells us in these pages why it is that children really rule the world, for all people, no matter what their station in life, were once helpless babies. He tells us that "a mother is the holiest thing alive," and why the future welfare of a race or of a nation depends so much upon the proper nourishment and care of their minds and bodies, the most difficult and the most necessary work in the world. He tells us too why the big open green stretches of the country are so much healthier for people than the crowded city streets; and he tells us what it is that makes us grow old and gives us crow's-feet and wrinkles about our eyes and mouths, and how the different kinds of wrinkles either make us cross and disagreeable-looking or pleasant-looking and full of fun. Of these and many other interesting things the Wise Man tells us. Let us read for ourselves and hear what he has to say upon a dozen questions or more that are puzzling our brains. There will be some things which we shall learn, too, about which perhaps we have never thought to wonder, as, for instance, Why is a star star-shaped? or Why can a hammer break a stone when a piece of wood cannot?

WILL THE CHILDREN RULE THE WORLD?

CONTINUED FROM 2804



IT is really true that the children of to-day will rule the world to-morrow. There is nothing we know better than that all men and women, kings and beggars, great and small, began as helpless babies, more helpless than any other kind of living creature, and there is nothing we more constantly forget. All individuals are mortal, and the destiny of the world, the ruling and the being ruled, is all in the hands of the children. Those who rule to-day were the children of yesterday, and will be dust to-morrow. That is the law of human life. It means that "a mother is the holiest thing alive," that history is made in the nursery, that the bringing up of children is the noblest, the purest, and the most necessary work in the world. And it is the most difficult, just because the human being is so wonderful and complicated in the nature of his mind and his body. When at last men come to see that real patriotism, real love of one's country, means, before all things, strengthening and ennobling its human life, and that, since we all must die, this means living to serve children—then not only shall we have the world ruled for children, ruled so that they shall be rightly prized, and nourished, and guided, and loved, and taught; but also these children will, in a few years, grow up, and the world will be ruled by them. The writer has two little daughters. He believes that the highest thing a woman can be is a mother, a maker of the life of mankind. He hopes that they will one day have children; and he lives and works to teach all who will listen, so that the children of to-day, and their children, may live in a better world, where no child starves, or cries, or works, or dies, or is afraid, or cold, or lonely.

WHY CAN'T A BABY TALK WHEN IT IS BORN?

There are many reasons. One is that the baby needs a lot of practice before it can get control over the muscles of its lips and throat and tongue, so as to speak. Even grown-up people, when they learn a foreign language, may fail ever to "get their tongues round" sounds which do not occur in their own language, and every nation accuses every other nation of using "jaw-breaking" words. Another reason why

the baby is not able to talk is that the part of the baby's brain by which talking is done is not developed when it is born —neither the part which hears sounds, nor the part which reproduces those sounds.

But the chief reason is that language entirely depends on imitation. We learn to speak by imitating the sounds we hear, and the baby cannot do this until it hears them, and then learns to distinguish them.

The more we study talking, the more wonderful we find it. There is nothing more marvelous in the world, though it is so common, than to watch a baby or a child learning to speak. If a human being, after being looked after for a little while, is entirely left to live by himself, as occasionally has happened, he cannot talk, but can only scream, or grunt, or point to things. It used to be thought that a child left to itself would speak in Hebrew, as that was thought to be the language of the Garden of Eden. As a matter of fact, a child left to itself becomes an idiot, and can hardly be recognized as human. "We are members one of another."

WHY CANNOT WE SEE VERY SMALL THINGS WITH OUR NAKED EYES?

If the retina, or curtain, at the back of the eye were a perfectly smooth, continuous thing like a piece of glass, we should be able to see much smaller things than we do. But it is a living thing made of living cells, and each of these can only see, so to say, one thing at a time. They are a certain size, and take up a certain amount of room, and there is a certain amount of space between them. Thus, the rays of light from a thing must be spread out enough to cover at least two of these cells—perhaps more—before we can expect to see two things separately. Of course, much depends on brightness. If a thing is very bright indeed, it will be seen by one cell of the retina, perhaps. Thus, a star may be seen, though the pencil of light from it is very narrow, while a tiny speck of something under our eyes, which sends a pencil of light just as big, will not be seen until we use a microscope. A large number of the stars we see are really double stars. The telescope shows us this by throwing the light on to more cells than one of the retina of the eye.

WHY IS THE COUNTRY MORE HEALTHFUL THAN THE TOWN?

The country is more healthful than the town only for two reasons, but they are very important. They are that the country gives us purer air to breathe, and more sunshine, as the country air is clearer and does not stop so much of it as town air does. On the other hand, the towns are usually much better off than the country in the matter of sewers and of water. Further, if people are wise and reasonable, it is better for their health of mind to see *not too few* people, and to be not too much forced in upon themselves. In this way the town is better than the country; and it is a fact that there is more insanity in the country than in towns. It is foolish to abuse cities blindly, as many people do. Civilization really means *city-fication.* There never has been a civilization without cities. Athens, and Rome, and Jerusalem, to which we to-day owe almost everything, were cities.

The time will come when people will see this, and will try to make their cities as healthful as the country in air and sunshine. They will not allow each other to make the air impure, and so they will get better air into their lungs and more sunshine; they will build all houses with gardens; they will stop the unnecessary noises of cities; and so will make places where men can meet, and gather, and mix, and make music, and hear each other speak, and discuss things, and do everything which men must do together—while they will keep the advantages of the country.

WHAT IS A GARDEN CITY?

Wise people, instead of trying to abolish cities, are now beginning to build cities of a new kind, which are called Garden Cities. Some day, no doubt, all cities will be of this kind. Every house in a garden city stands free of its neighbors, and has its own garden. The roads are wide and well provided with trees. The rich amount of green leaves helps to purify the air, and the people are not so overcrowded as to make it foul. Smoke is not allowed to come out of chimneys. There are many ways of consuming smoke and making it useful instead of dangerous. No one is allowed to buy a piece of land and cover it with slums. There is a splendid garden city,

the first in England, near Letchworth; and certain wise employers have built smaller places of the kind. As we might expect, fewer babies die in one of these garden cities—Bournville, near Birmingham—than in any other place of the size in the whole of England. The next thing that may happen, as people begin to learn good living and good government, is that the land round cities will be bought by the city and used properly, instead of being bought by private people to make money, at the cost of thousands of lives. This is already being done in Germany and Australia.

WHY IS IT THAT SO MUCH OF NATURE IS GREEN?

Wherever life can find a footing in Nature, there we find it. It varies in a thousand ways, but we find it almost everywhere. It is always limited, and decided by the food supply; and thus we find it most abundant where the food supply is most abundant. Thus, the distribution of living things depends on the distribution of the kind of food that they live upon. If that is widely distributed, so are they; if the food is not widely distributed, neither are they. Of all the possible foods for life, by far the most widely distributed is carbon dioxide, as that occurs in the air, and so is to be had wherever the air is. Thus, the most widely distributed kind of life is that which is capable of feeding on carbon dioxide, and the only kind of life which can do this is that which produces the green substance called chlorophyll—one of the most important chemical compounds in the world. That is the reason why so much of Nature is green. And if we know the relation of the green plant's life to our own, we should learn that there *must* be a certain amount of green life in Nature, if we are to live. At present we destroy green fields and cut down green trees without any thought of the results — for our cities, and tables, and other purposes. But much of Nature must always remain green, unless man learns how to use the carbon dioxide of the air as the green plant does; and of that he shows no sign at present.

WHY SHOULD LIGHTNING STRIKE CERTAIN THINGS AND NOT OTHERS?

We know that if lightning can choose between a lightning-rod—that is to say, a rod of iron—and the rest of the roof of a house, it will go down the rod. We know that it will always choose metallic things rather than any others. And it will strike a tree rather than the ground beside the tree. In every case the principle is the same. It is that electricity will always choose the easiest path. The usual way of saying this is that it takes *the path of least resistance*, and the principle is true of many things besides electricity. It is often true of ourselves. Thus, if the electric current can pass to the earth through a tree, it will do so, because the tree helps its passage downwards. That is why we should never stand under a tree during a thunderstorm. But, for choice, it will always pass through anything made of metal, such as iron, for the whole group of metals are good conductors of electricity —the best there are. We do not know *why* they conduct it so well, but we do know that that is the reason why lightning chooses to pass through them. So a lightning-rod will protect a house, provided that it runs right down into the earth. If the lower part of the rod has rusted away before it reaches the earth, as sometimes happens, the electricity will be discharged into the house, and then the rod does more harm than good, for it attracts the lightning to the house, and does not protect it.

WHY DO WE GROW OLD?

This is a most difficult question, which some of the wisest men now alive are trying to answer. The chief reason seems to be that gradually there is heaped up in our bodies a certain amount of the waste products of our lives. We get rid of most of these quite easily, especially the gaseous ones, like carbon dioxide. But there are others which we do not completely get rid of, and at last they poison us, make our limbs and joints stiff, our hair fall out or turn grey, our skin shrivel, and so on. This process takes much longer in some people than in others. It is strictly true to say that some people are older at forty than others are at seventy. This teaches us that it is not the mere passage of time that makes us old, but what is happening during that time in our bodies. People who lead wise lives, especially people who do not eat too much or drink too much, and who get enough sleep, during which the body gets rid of and

destroys many of the poisons it produces in the daytime, do not grow old nearly so quickly as other people. Also this is true of people who have quiet minds. Great worry or sorrow "ages" people, as we say; it interferes with the power of the body to recover from exertion and to get rid of its poisons, and so unhappy or fretful people grow old more quickly than those who lead calm and happy lives. The people who take longest to grow old are those who act on two good proverbs: "The best doctors are Dr. Quiet, Dr. Diet, and Dr. Merryman"; and

Joy, and Temperance, and Repose
Slam the door on the doctor's nose.

WHAT IS IT THAT MAKES WRINKLES?

The wrinkles of elderly people are due to a slow process of wasting in the skin. It is a curious thing that we can, by good sense and cheerful minds, control the process of growing old in everything that matters, and especially in our brains, but we cannot in the case of our skin—just where old age shows most, and just where it matters least. The skin becomes shriveled and puckered, and especially do we notice wrinkles in people who are rather thin, for this means that a good deal of fat has disappeared from under the skin, so that it is too loose for the body, and falls into wrinkles. In extremely old people, perhaps ninety years old, the skin grows so thin, and so much of it wastes away, that all the wrinkles disappear, and their faces become quite smooth.

There are different kinds of wrinkles that look very different to our eyes. In people who have often scowled and been angry, and have often felt hate or hardness to other people, the wrinkles which form on the face tell their tale. We say that such a person has a hard face, and children usually run away from such a person; and in other elderly people, who have often smiled and sympathized with others, and have had cheerful lives, and tried to make others cheerful, the wrinkles form round the eyes and mouth in a way that makes them look kind and nice; and children, who are very wise in such things, usually take to these people at once.

WHY DO I JUMP WHEN I GET A SHOCK?

The jump when we get a shock, or the closing of our eyelids when something comes near to them, is called a *reflex action*. Reflex actions are constantly occurring in our bodies, and in those of all living creatures, and we could not live without them. They are called "reflex" because the action follows at once on the thing that excites it, almost as if it were a ball or something reflected from a wall. The mark of a reflex action is that the *will* is not concerned in it; and that is the whole point of this question. We do not want to jump, we do not make up our mind to jump, but we jump first, and then notice that we have jumped. The will does not cause reflex actions, but it can often control them if it has time and warning given to it. That is why we jump at an unexpected sound, as when someone bangs a door; but not at an expected sound, as when we bang the door ourselves.

WHY DO PEOPLE PUT A MARBLE IN THE KETTLE?

The water we boil in a kettle is never pure water, but contains many things. It contains salts, which are apt to be deposited in the kettle as the water boils away. It also contains acids, which are able to act on the iron of the kettle, and turn it into salts of iron, which also fall to the bottom; besides this, they are actually made by the water from the inside of the bottom of the kettle. I suppose, then, that people have noticed that if they put a marble in the kettle, it collects these salts and prevents these things from settling inside it, and keeps the inside of it smooth.

WHY DOES A BICYCLE KEEP UPRIGHT?

In answering this question, we may teach ourselves the way in which we try to solve questions like this. We know that the bicycle does not keep upright when it is still, but it does so when it is in motion. The same is the case with a hoop. The more a bicycle or a hoop moves, the more surely does it tend to keep upright. There must be something, then, in the nature of motion that keeps the bicycle upright; not something in the bicycle itself, or else it would keep upright apart from its motion. When we have gone so far as to realize this, we may hope to find the answer to the question, for we have our attention fixed on the point which contains the answer. Now let us consider what we know about motion, and see whether that will explain

this case. Some of us, who have read this book carefully, will now be able to answer the question. Newton's first law of motion must be the answer. This says that a *moving* thing will move at a constant speed *in the same straight line* for ever, unless it is acted upon by some other force. That is what happens to the bicycle or the hoop. It is a *moving* thing, set moving in a certain direction, and, according to the first law of motion, it *must* go on moving in that same line until something interferes with it, and so it keeps upright.

WHAT IS INERTIA?

We probably know what we mean when we say that anyone is *inert*. It means that he does nothing "of himself," but has to be made to do anything he does, and that he is even then only *passive*—acted upon, not *active*. *Inertia* is thus the name given to the property of matter by which, in the question of motion, it is inert. If at rest, it remains at rest until something acts upon it. If moving, it goes on moving, changing neither its direction nor its speed, until something acts upon it. In other words, the first law of motion, which explains why a bicycle keeps upright, is the law of inertia. It says that, so far as motion is concerned, matter is passive, resting unless something moves it, and moving unless something brings it to rest. This inertia, or passiveness, or tendency to go on doing what is being done, is also, I think, the first law of mental motion. Our minds do not move unless and until something moves them; and when we have got "into a groove," as we say, we are likely to stay there until something jogs us out of it. We ought also specially to remember what people usually forget—that inertia, whether of matter or of mind, is shown as much in the going on until something interferes, as it is shown in resting until something interferes.

WHY HAVE THE STARS JAGGED EDGES, NOT ROUND, LIKE THE MOON?

This is one of those many cases where what we seem to see is not at all in what is outside us, but is in ourselves. If we look at the stars through a telescope, or if we have perfectly shaped eyes ourselves, or use spectacles very accurately made to suit our eyes, the stars do not always seem to have jagged edges, but may be seen as sharp points of light. So part of the answer to the question is that the eyes of most of us are not quite perfect in the way they throw the light on the retina, and that this defect causes a blur, and is revealed especially when the thing we are looking at is very small; or, rather, seems very small, as the light from it only strikes upon a very tiny portion of the retina. It may be, also, that this appearance of the stars is partly accounted for by a special fact about the eye which is called *irradiation*. This means that the image of any bright thing is apt to spread itself out, or *irradiate*, in the eye, so that it seems to excite parts of the retina on which the light is not really falling at all. The excitement spreads a little, somewhat as a dot of ink, made on some kinds of paper, spreads a little round it—and so the thing we look at seems bigger than it really is, and often a little irregular in shape.

WHY IS A STAR STAR-SHAPED?

When I had answered the last question about the stars, said the Wise Man, I thought I had better go out and see the stars, as it was a clear night, and the first I saw was Capella, one of the finest in all the sky. It lies below and to the left of the L of Perseus, as everyone should know. And though I was wearing accurate spectacles, Capella was most perfectly star-shaped, with four beautiful points at equal distances from each other all round its edge. This perfectly regular figure, which has been noticed in all ages, and from which the starfish gets its name, is undoubtedly due to the structure of the eye, and it seems to depend partly on the state of the eye at the time, as we do not always notice it. It is never seen in the photograph of a star. When we study the arrangement of the sensitive points in the curtain of the eye, it seems that the sharp, bright image of the star falls upon one of them only, and then, by a sort of sympathy, affects equally those that are packed closely all around it, and we may perhaps find that the arrangement of these *cones*, which is the name we give to the sensitive spots in the centre of the retina, is just such as would account for the appearance of a star. It is probable that no other thing but a star produces a pencil of light so fine as just to strike directly one cone of the retina, and only one.

WHY IS FIRE COOLER THROUGH GLASS, IF GLASS MAKES THE SUN'S RAYS HOTTER?

This would, indeed, be a puzzle if it were true. It would mean that the radiant heat from a fire is somehow different from the radiant heat from the sun. It is true that glass cuts off the heat of a fire, as everyone knows who has used a glass screen in front of the fire. But it is not at all true that the sun's rays are hotter through glass than in the open. The glass of a greenhouse cuts off a good deal of the sun's heat, just as it would cut off the heat of a fire. But the air is kept in the greenhouse, and so gets hotter and hotter. It gets the heat and keeps it to itself, so that it does not get out again. So a greenhouse, though it keeps out some heat, grows hot because it is *a trap for heat*, and keeps what heat it does get. Of course, the sun does not always shine, and so we must have hot-water pipes in a greenhouse to make the air hot when the sun does not. A tent acts in the same way; and everyone knows how hot the inside of a tent becomes. It cuts off a lot of heat, but it lets some through and then traps it by making it heat the air which it confines within itself.

HOW DOES THE SUN MAKE A MAGNIFYING GLASS BURN A PIECE OF PAPER?

This question would be better put the other way round—how does a magnifying glass make the sun burn a piece of paper? Just in the same way we say that the sun makes the green stuff of the leaf decompose the carbon dioxide of the air, but we should say that the sun does it by means of the leaf. Always the sun is the real cause. In this case it is the concentrating power of the lens that helps the sun. We know that when light passes through a convex lens it is bent towards the thickest part of the lens—which is the centre—and that the rays are all brought to a point, which is called the *focus*. We see this when we make the experiment of burning paper. We see the light brought to a focus, but it is not the light that burns the paper. If, instead of the glass, we had a hollow globe filled with cold water, kept changed, the light would be thrown on the paper just the same, but it would never burn. It is the heat-rays of the sun that burn the paper, and the interesting thing, which we must be careful to remember, is that heat-rays are bent by lenses exactly as light-rays. The two kinds of rays obey exactly the same laws, which is natural enough, since they are varieties of the same thing, though we happen to feel the one and to *see* the other. Of course, no heat is made out of nothing in this case, or in any other case. The paper round the bright centre loses the heat which the centre gains.

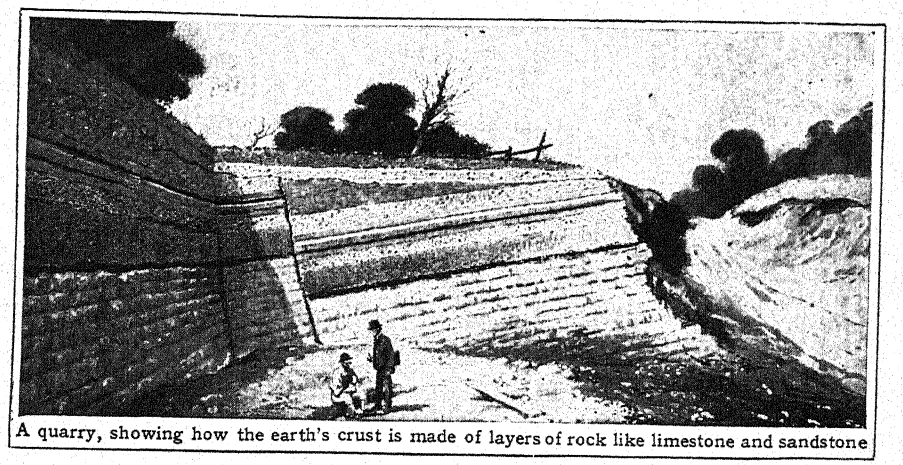
HOW WILL A HAMMER BREAK A STONE, BUT A PIECE OF WOOD WILL NOT?

A stone is held together by a special kind of force in the molecules that make it up. This force is called *cohesion*, or sticking together. When the stone is broken this force is overcome, so that the molecules are forced apart. Now, if a force is to be overcome it must be by a stronger force. It must be, then, that there is more force in the blow of a hammer than there is in the blow of a piece of wood, and that is exactly the case. The reason why the hammer-stroke is more forcible depends upon the heaviness, or mass, of the hammer. Let us suppose that the wood is moved at the same rate as the hammer. Then the hammer is more forcible in proportion to its greater mass. If the hammer were moved slowly, and the wood at a very great speed, the stone would break if the wood did not. The force of a moving body depends on two things—its mass, and the speed at which it moves.

CAN A FISH SEE AND HEAR US?

If we go to an aquarium, or to the fish-houses at some Zoological Gardens, we shall soon see for ourselves that fishes can see us, and see very well and quickly, too. Every fisherman knows this. He knows, too, that fish are very particular about color, and that they catch things by sight as well as by smell; for a fisherman's flies are not scented, but colored, and the fish come to them very readily if they are of the right kind. Then we all know that fishes have eyes, for we have all seen them, and they are quite highly developed eyes, not so very much inferior to our own, and made on much the same pattern. On the other hand, fishes are decidedly inferior to us in hearing; though they are by no means deaf, they do not respond to music as they seem to respond to color.

THE NEXT QUESTIONS ARE ON PAGE 3043.



A quarry, showing how the earth's crust is made of layers of rock like limestone and sandstone

THE EARTH'S CRUMBLING CRUST

CONTINUED FROM 2847



AS we have learned, astronomers are trying to understand a little of the history of some of the heavenly bodies. We know a very little of the history of the stars, and this is helping us to learn something about the history of the sun. As regards the history of the moon, we might expect to be able to learn a great deal, but this offers many difficulties, and, indeed, there are many careful astronomers to-day who declare that even what we call the volcanoes and craters of the moon are not really volcanoes, but are the marks of scars left upon the moon after its surface, unprotected by any atmosphere, has been struck by huge meteors. The lesson we have to learn is that explanation, or interpretation, as it is called, is very difficult, and must only be made after description.

If now we turn to our own earth, we shall expect here, at any rate, to be able to read a definite history. Not only have we the moon, as it now is, and the differing states of the various planets such as Mars and Jupiter to guide us, but the earth's crust is under our very feet; we can dig mines in it; we can make still deeper borings in it; we can study the sides of its great gorges; we can climb its mountains, and so we should be able to read its history. It has been necessary, not once, but often, in in what we have already learned, to refer to this study, which is called Geology. We have learned a little, for instance, of the part that water plays in the history of the earth; we have heard about the element radium, which helps to keep the earth's crust warm; we know that there are rocks which were formed by water, and rocks which were formed under the influence of heat. We shall now make a survey of the main facts and ideas of geology, enough for us to be prepared to follow what the geologists shall teach us in the future, for our best knowledge of geology is no doubt yet to come, and will be coming very soon.

We all know that not many years ago there occurred in the south of Europe the greatest earthquake recorded in human history. Now, it is earthquakes, and the eruptions of volcanoes, and the other violent things which occasionally happen that tempt us all into an utterly wrong idea of the earth's history—an idea which, though wrong, was generally believed in by geologists less than a hundred years ago. We sometimes think that it is the violent, exceptional things that have made the history of the earth, earthquakes, hurricanes, tidal waves, and so on. We notice nothing else

happening, or if we do notice such a thing as that the bed of a river is becoming wider or deeper, we cannot imagine that such little and slow things can count for much. We look at the history of the earth just as historians once looked upon the history of mankind. One of the greatest authors of modern times has written words which are for ever a lesson to historians of mankind and to students of the earth's crust. In his book on the French Revolution, Carlyle tells us how the oak grows for a thousand years in the forest, little by little, and no one takes any notice; then perhaps it happens that the lightning destroys it, and everyone records the fact.

THE HISTORY OF THE WORLD IS BEING MADE IN EVERY NURSERY ON EARTH

The truth is that the history of men is being made at this moment in every nursery on the face of the earth; and the history of the earth's crust, like the history of man, is really made, from moment to moment, by little things which do very little in a moment, but do a great deal in a million years. We need not here trouble about the long words which describe the two opposing schools of geology. It is enough for us to know that victory all along the line lies with the newer school, who believe in the slow, continuous making and changing of the earth's crust, as against those who believed that the earth's history has been alternately periods in which nothing happened, and times of destruction in which all life was killed, and then a fresh start made.

The newer and truer view not only helps us to understand the past, but it transforms the study of geology for us to-day, because we to-day, as we cross a stream, or see the rain fall on a rock, or play with the sand on the seashore, can see and watch for ourselves the slow happenings which have made, are making, and will make the history of that narrow belt between earth and sky which gives birth to all living things.

PERHAPS ANOTHER SHAKESPEARE OR ANOTHER NEWTON WAS BORN TO-DAY

This is a great idea, and it applies equally to human history. We find that there is no news in the papers, and we think that nothing is happening. We are very wrong. Perhaps another Newton or another Shakespeare was born to-day, or a baby who will become a statesman and save or destroy his country. Human history is always being made. This book is making it; we are making it, as we are writing or reading these pages; and the rain at this moment outside is making the history of the earth's crust. But it is one of the laws of our minds that we do not notice what we are accustomed to see. What really catches our attention is something that is new, or big, or quick. As long as the ball of paper is still, the cat will not move; we twitch it and the cat sees. We also see when things are twitched. We put our history, or the earth's history, down to battles and earthquakes, not to the quiet mothers whose names are unknown, nor to the rain and the dew falling where no one sees them. The greatest thing that science has to teach us is that history is always being made everywhere, and that only what might be called the bubbles, and froth, and splashings of it—that are called earthquakes, and battles, and so on—get into the newspapers.

HOW GEOLOGY TELLS US THE STORY OF THE EARTH

So now, having already learned what is by far the greatest lesson that geology has to teach us, we may go on to look at the main facts of the earth's crumbling crust. We must borrow help from almost all the sciences; we must know everything that geography can teach us, for the geography that deals not with cities, but with mountains and rivers and so forth, is simply the latest chapter, but not the last, of geology.

We must learn everything that the chemists can teach us about the atmosphere and the weather. If the chemist finds carbon dioxide in rain, and can prove that that carbon dioxide helps to melt the rocks, that is part of geology. If students of the wind observe how it alters the surface of things, that is part of geology. We must study, where we can, the results of frost and rain, waves and tides, rivers on the surface or under the surface, glaciers or ice rivers. These are the tools of earth sculpture. If we watch them at this moment, we can see them carving, molding, biting, smoothing, wherever there is dry land, and so we can learn to read the history of the earth. Geology also borrows from

the students of earthquakes and of volcanoes. The greatest results of earth sculpture, we know, are the mountains. Is it earthquakes and volcanoes that have built the mountains? Up to the present this has been generally believed. But geology, which is the borrowing science, borrows also from chemistry, and in the twentieth century chemistry is beginning to teach that there are elements of which radium is the type, our study of which will utterly change our ideas of mountain building.

HISTORY & POWER ARE NOT IN VIOLENCE, BUT IN THE STILL SMALL CAUSE

As in every case before, this new change, which is only just beginning to take place, is in the direction of teaching us that the sudden, big, disastrous, sensational things, like earthquakes, are not the most powerful forces at work; or if they are the most powerful, they are not the most effective. Earthquakes have had something to do, no doubt, with mountain building; yet it is more likely that at least one great agent of mountain building has been the slow but steady change in the earth's crust produced by the presence of radium, which is a ceaseless maker of heat with all its consequences.

But the borrowings of geology are not yet ended. It learns a great deal from that department of chemistry which is called mineralogy, or the study of minerals. Everything mineralogy has to teach about crystals, how they are made and how they break, how they are melted, what they weigh, how hard they are, and so on; and not only these things, but also the places where minerals are found in the earth, how they lie in veins, as they are called—all these things come to form part of geology. Nor has this exhausted our sources of knowledge. Everything we know about life contributes to geology. The rocks have records of many forms of life, some of which are utterly different from any now existing, while others cannot be distinguished from living forms.

THE WONDERFUL WAY IN WHICH WE LEARN FROM BURIED ANIMALS

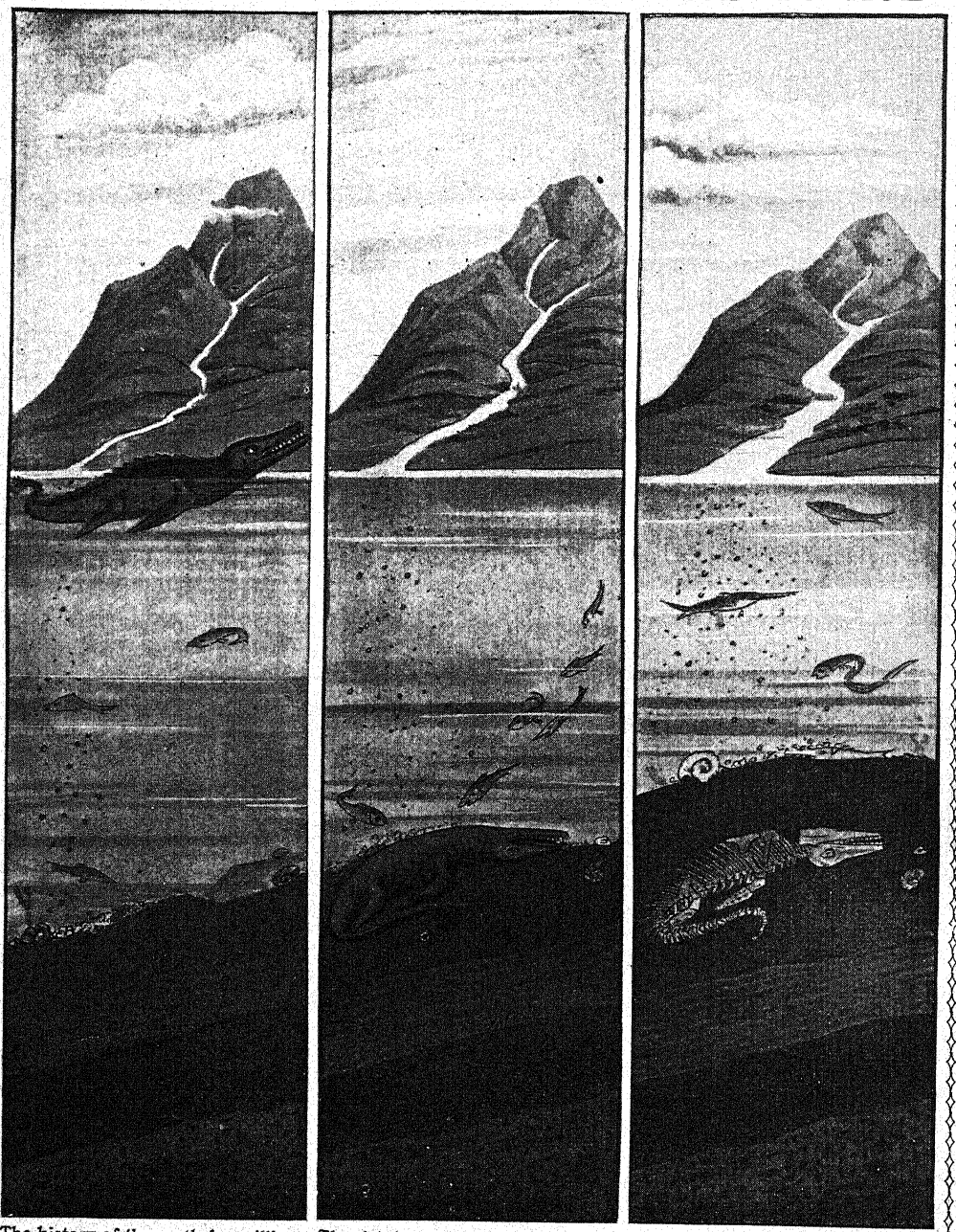
Geology gains enormously from the study of these remains, and it is no less true that the study of life gains greatly from geology. Indeed, the record of the rocks and the record of life are largely one. Unfortunately, the rocks have not yet taught us all we might hope to learn regarding the history of life. It is now many years since the publication of that great book "The Origin of Species," in which Charles Darwin discusses what he called the imperfection of the geological record, and that record is still imperfect. But if we come to think of it, there is something wonderful in the fact that fossils are preserved at all. We need not wonder that they are so few. If we consider how many conditions are necessary for a fossil to be made and preserved, we shall wonder that they exist at all. Frost and rain and the sea, dripping water, pressure, heat produced by lava, and so on, must have destroyed countless millions of fossils; nor is the body of every kind of living creature fitted to produce a fossil at all.

But the people who complain that the rocks do not teach us what we should expect about the history of life forget how very little of the rocks we have yet studied. To begin with, only two-sevenths of the earth is at present above water. Every portion of that has no doubt been below the water, and the present ocean-beds have at one time been dry land covered with life.

THE KNOWLEDGE THAT HAS GROWN FROM THE STUDY OF A BIT OF THE EARTH

All we have access to is what is found on these two-sevenths, which is by no means necessarily the most important part of the globe so far as the history of life is concerned. But even of this portion only tiny points have been studied, especially a good deal of Western Europe, with bits here and there elsewhere. We have not begun to examine properly anything like one-thousandth part of so much of the earth as we can examine at all. The really marvelous thing is that so little inquiry has produced so much result. We should know that latterly these results have dealt not only with the past history of animal life, but with the past history of vegetable life. During the last century we have actually discovered scores of thousands of different species of fossils, and, as Professor Huxley said, "we have no more ground for doubting that these creatures really lived and died at, or near, the places in which we find them, than we have for doubt about a shell on the seashore. The evidence is as good in one case as in the other."

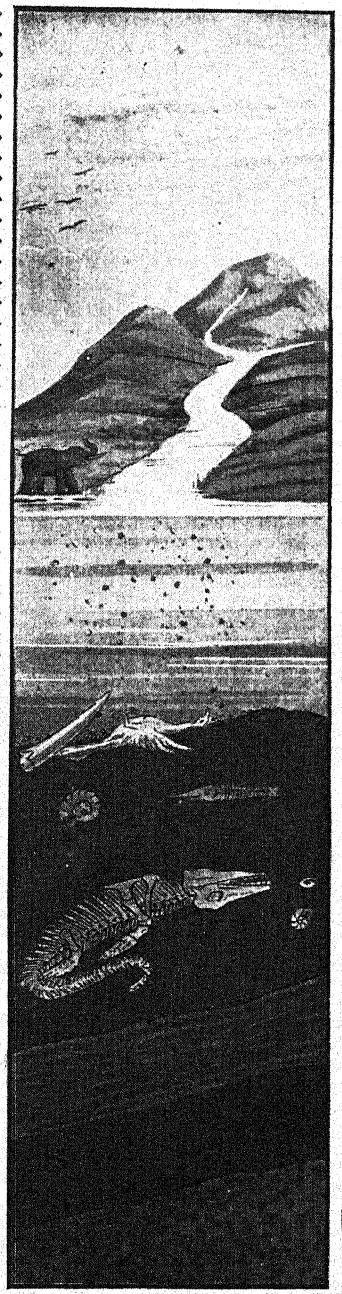
THE CHANGING EARTH FROM AGE TO AGE



The history of the earth for millions of years is written in its rocks, and men are able to read what took place, and to give us, in pictures like these, a vivid panorama of the earth's long story. We can see also how that story came to be written in the rocks. A million years ago, a little stream trickled down a mountain, carrying with it sand and stones, which fell to the bottom of the sea. In the sea swam a wonderful creature called an ichthyosaurus.

The ichthyosaurus was a reptile that lived in the sea, and its name means "fish-lizard." It had a great head with powerful jaws and teeth, and its body had four limbs like paddles which enabled it to swim. One day the great creature died, or was killed in battle with another strange monster, and its body fell to the bottom of the sea. Meanwhile, the stones and sand brought down by the stream continued to fall upon the bed of the sea.

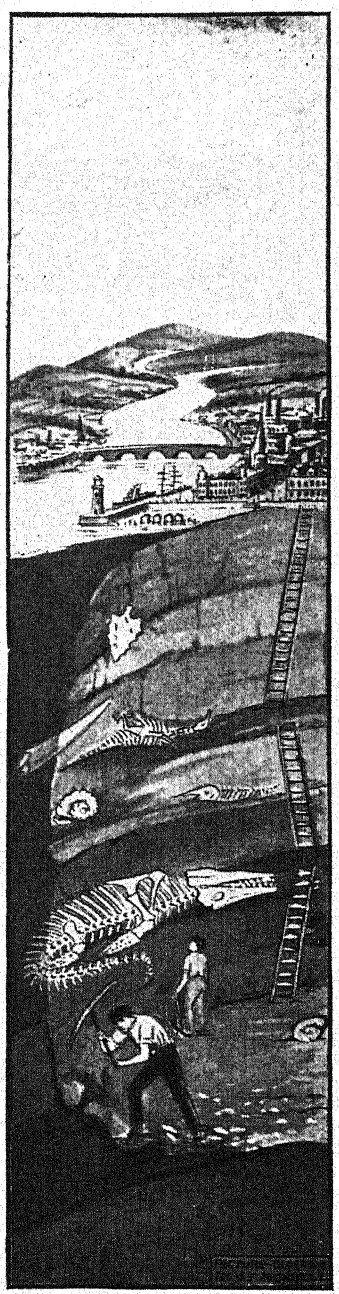
As the ages passed, the stream gradually wore away a wider and deeper bed, and became a big river; and the rains falling upon the mountain loosened the soil and formed hundreds of streamlets. These ran into the main stream, and each did its part in wearing away the mountain. As the river became wider, it brought down more and more earth and stones, which fell in a never-ceasing shower upon the bed of the sea, until the great reptile's body was buried.



Higher and higher rose the ocean-bed as the mud from the mountain continued to fall, and the lower layers became pressed into hard rock. One day an elephant broke off his tusk, which fell into the river, was carried down and sank in the sea. Another day a bird was drowned, and it fell on the ocean-bed. Dead fishes and shells also sank, and all were buried by the never-ceasing shower of mud, earth, sand and stones.



All through these ages the rain and river were wearing the mountain away. Hundreds of thousands of years after the ichthyosaurus died, men began to live on the earth, and one day a man who had made a boat out of a hollow tree-trunk went out to fish. Trying to spear a big fish, the head of his harpoon broke off and fell. It was too far down for the man to recover it, and this also was buried in the mud.



The bottom of the sea crept higher, till at last it became dry land. Then men began to dig, and the world's wonderful story was revealed. First the spear-head was found, then the tusk, the bird's skeleton, the shells, the fish, and at last the skeleton of the great reptile, all turned to stone and become fossils, a word meaning something dug up. Only a few years ago, a great fossil skull was dug up in Fleet Street, London.

What we learn in this way is really a record composed of mud, and though we might suppose that it is not worth anyone's while to ask how mud is formed, yet the answer to this question is a key to a great deal of geology. Mud is formed by the action of water, wearing down the surface of the earth and rocks with which it comes in contact, pounding and grinding them down, and carrying the pieces where they can rest together.

ROCKS THAT ARE NOW BEING MADE AT THE BOTTOM OF THE SEA

Every wave of the sea as it breaks on the shore does this; and thus, to quote the words of a great authority, "slowly but surely the hardest rocks are gradually ground down to a powdery substance; and the mud thus formed, coarser or finer, as the case may be, is carried by the rush of the tides or currents, till it reaches the comparatively deeper parts of the ocean, where the water is so calm that the finest particles can sink to the bottom."

In a similar way the river carries part of the land into the sea, and so layers of mud are formed at the bottom of the sea. These gradually harden, and make a record of time. When they are hard, we call them sandstone or limestone, or whatever the rock may be. The surface of the earth is made up of these rocks, of which we know a thickness of not less than 70,000 feet. They are being made now. Such chalky rocks as we know are found at Dover, for instance, are actually being made at this moment at the bottom of the Atlantic.

A tremendous story is written in these rocks. We know, for instance, what myriads of creatures are living in the sea, and when they die, their shells and hard parts, lying at the bottom, may be covered by the fine mud which is brought down by the wear and tear of the sea and the rivers.

THE STORY OF THE STRANGE THINGS THAT WE SEE IN THE MUSEUMS

This mud becomes hardened, and ages afterwards people may walk into a museum and see the piece of sandstone or limestone in which these remains are embedded. This process applies as well to many land creatures. It applies to such cases as where turtles' eggs were laid upon the sand, but before the sun had time to hatch them, were covered over with chalky mud. All this occurred unthinkable ages before mankind existed, and the results are now to be seen by us. Or the bodies of creatures may drift away to sea, or get buried in bogs, or be crushed into the mud at a river's bank.

It is, however, very rare to find the remains of a wild animal in fossil form. Either they die where their bodies are not protected by mud, or the bodies are eaten. Not only so, but when the bones of an animal have been safely embedded in mud, they may yet be dissolved completely away by water containing carbon dioxide. Huxley had some pieces of rock sent to him from Scotland which contained no fossils or bones, but holes only. When those cavities were filled with something, so that a cast was made of their shape, it was found that they corresponded to the vertebræ and part of the armor of some great reptile more than twelve feet long. As Huxley says: "This great beast had died and got buried in the sand; the sand had gradually hardened over the bones, but remained porous. Water had trickled through it, and that water, being probably charged with a quantity of carbon dioxide, had dissolved all the calcium phosphate and carbonate, and the bones themselves had thus decayed and entirely disappeared."

THE GIGANTIC CREATURES OF THE PAST THAT LIE HIDDEN IN THE ROCKS

Now that we understand what fossils are, and how they are formed, we must learn what they teach us. This part of science has a special, long name of its own, and men may devote their whole lives to small parts of it. Here, of course, we want to know the great result of all this study, if there is such a result. We find, then, that these fossil remains, both animal and vegetable, correspond very largely with the living forms of to-day, and yet differ from them. If we were to walk through a museum containing fossil remains mixed up with those of creatures now living, it would only be when we looked closely that we should notice differences. One very notable exception there is to this, and that is the case of certain very large reptiles, very fierce looking and alarming, which no longer exist. Only lately have we learned the astonishing size that these creatures attained, and no one should live in, or visit, New York without going to the Natural History Museum on

Central Park, to see the amazing skeletons of these extinct beasts that have been mounted there. Our study of the rocks thus teaches us something about life which we must notice here. It is that at one time Life tried the method of sheer bigness; tried it persistently and tried it thoroughly, and it failed. These creatures grew to be as big as houses, but their brains were tiny, and the law of the world of life is that mind is the master of matter. Their size did not save them from the results of their stupidity. People who now devote their lives to the culture of their muscles, and forget the culture of their minds, may learn something from these monstrous reptiles of the chalk deposits.

A very vivid way of getting an idea of the rocks and their contents is to put down in order what we should come across if we began to dig, say, in Trafalgar Square, London. First, we should come upon beds of gravel or drift, containing the bones of large animals, of varieties now extinct, such as the elephant, rhinoceros, and cave bear. Such remains were found not many years ago, including a magnificent skull, when builders were enlarging the office of a London newspaper in Fleet Street.

Below this we should come to the London clay, as it is called, containing remains of strange cattle, remains of turtles, palms, and large tropical fruits, with shell-fish like those we see now only in tropical regions. When that bed was forming, we understand, these regions were tropical. Below the London clay we come to the chalk. Creta is the Latin for chalk, and the proper name for this chalk is the *cretaceous* layer. Here we find the giant reptiles, and some reptiles that flew in the air and teach us where the birds have come from.

As we went farther down, we should find other remains of lower types, shells and remains of early fishes. The lower we went, the greater would be the difference between the living forms of which we found the remains and those that live now. After a time remains would become very few and simple, and lastly we should come upon layers which yielded no evidence of life, and, indeed, which correspond to a time when there was no life upon the earth, and when its crust was still in the fiery condition which we have studied under astronomy. Of course, we must not imagine that all over the earth we find a perfectly regular arrangement of layers without breaks. Here we have been describing



A SLICE OF THE EARTH'S CRUST

If we could cut a slice from the earth's crust it would look something like this. First we find remains of present-day animals, and stone weapons used by the early men.

Then we find the remains of the mammoth, the great Irish elk, and the woolly rhinoceros, which lived when the greater part of our earth was covered with mighty glaciers.

Next we find fossil bones of huge animals like the giant sloth, and of smaller creatures like the ancestor of our modern horses, that lived a million years ago.

In this section we see the remains of the mighty mastodon, and a tiger with teeth as large as walrus tusks. Elsewhere in this book we see what all these fossils were like when they were alive,

Then we come to the chalk rocks, with their giant reptiles, their great flying dragons, and the remains of birds, which first began to appear in this age, perhaps three or four million years ago.

Lower down, the rocks contain remains of the gigantic "fish-lizards," with necks like snakes, that lived in the Age of Reptiles, six or seven million years ago.

Next we come to the carboniferous rocks, with their remains of mighty forests that have become coal, in the fifteen or twenty million years since they grew. Crocodiles appear in these rocks.

Still lower, we have the remains of fishes which existed when nearly all living creatures dwelt in the sea.

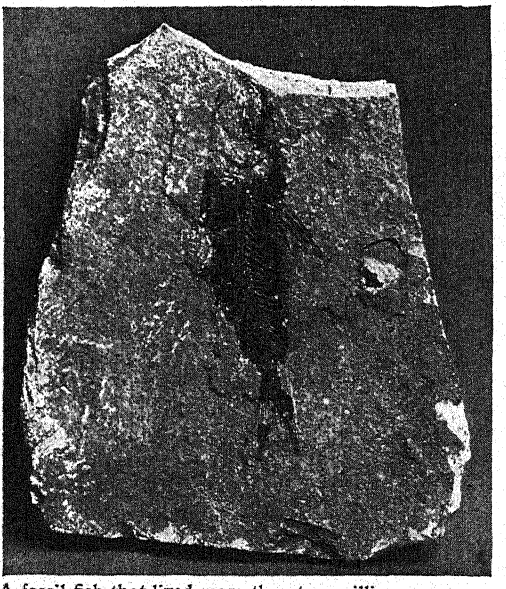
Below this are also fishes, including the first vertebrates, or back-boned animals.

Lower still are various shell creatures, and seaweeds, of thirty million years ago.

Finally, we have the first traces of living creatures; with the hard rocks formed by fire, lowest of all.

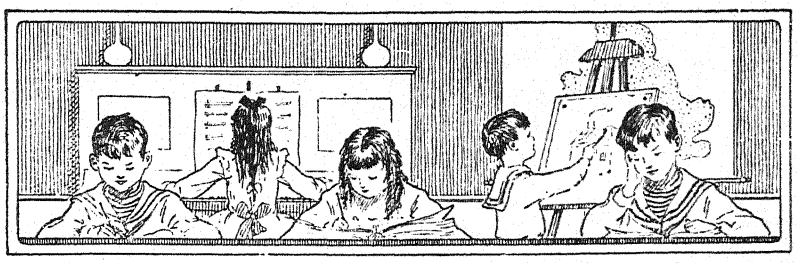
them in order to get a view of what they teach us regarding life; but many accidents and breakages have happened, so that we find the layers mixed up in many places. We may find places where we come to layers of quite another kind, and where there has actually been a crack, on one side of which the earth has been heaved up, or has fallen down. When men are seeking coal, or gold, or something of the kind under the ground, it is very annoying to come to places like this. They are called "faults" by men who study geology.

But such places teach us something of what an earthquake means, and terrible instances like the Italian earthquake show that from these cracks and violent disturbances of the crust of the earth there may follow consequences so great that the map of such places may be greatly changed. Sicily, for example, in consequence of an earthquake like that which has recently taken place, might possibly become joined by dry land to Italy. We may say that this looks as if it were a contradiction of what we began with—the great lesson that the earth's history is made by small things. But what makes the earthquake? It is the small, slow, sure processes that are always going on. We live on a hot ball, the interior of which is slowly losing its heat and shrinking. The crust which is supported on this interior is constantly having its support drawn away from under it. So it must fall and follow. When an apple shrinks, the skin must follow, and so the skin becomes wrinkled. It is possible that mountain ranges are in part produced by this wrinkling of the earth's skin as the interior shrinks. Also the crust gives way at various places. It may do this very suddenly, just as a steel rod may give way all in a moment, though it does so because it has been slowly rusting for months. Hence the earthquakes that produce great results very suddenly are themselves the results of the slow age-long forces which really make the history of the earth's crust. As these forces go on working, the crust may seem to rise or sink here or there; water and dry land change places, sometimes in a moment—the disappearance of an island has actually been photographed—but more often by processes that leave no outward sign save in hundreds of years. If there is any one idea that we should have in our minds and always keep there about the earth's crust and the whole science that is called geology, it is that geology is not simply a record of a past process that has now come to an end, but that the forces which have made the past history of the earth are still at work. We are in a stage, just as creatures that lived five or ten million years ago were in a stage. They were on the surface then, we are on the surface now. Boston has more than once been at the bottom of the sea and will doubtless be there again. There is nothing permanent in boundaries or frontiers, whether made by water or by mountains. The one thing that may outlast the United States or the Himalayas is the human mind, and the truths and beauties that it can discover and imagine. These are the only kind of legacy that we can hope to hand down to remote ages of men, who may live on some new continent which is now beneath the ocean's waves, and may sail in their ships over what once was Great Britain, but will still know and honor the names of Shakespeare and Milton and Newton and Harvey and Darwin.



A fossil fish that lived more than two million years ago.

THE NEXT PART OF THIS IS ON PAGE 3031.



WORDS USED IN THE PLACE OF NOUNS

CONTINUED FROM 2607

SO far we have only learned two kinds of words. First, words that are names of people or things, like BOY, DUCK, KING, SHEPHERD; and, second, words that tell us something about people or things, like GOOD, TALL, BLACK. Do you remember what these two kinds of words are called? It does not matter very much whether you remember or not, as long as you know the difference between these words when you see them. But when you grow up and go to school (though, perhaps, you do go to school already) you will have to learn to call the first kind NOUNS, and the second kind ADJECTIVES.



Now let us pretend again. Suppose someone came to you and said: "Please tell me a story — tell me a story about BOYS and GIRLS and FAIRIES and WOODS and LIONS and TIGERS and CAKE and GINGERBREAD and INDIANS, and all sorts of things." Now, how would you begin to tell a story that would please the person who asked you? Well, of course, you would begin with "Once upon a time," or else it would not be a proper story. And then you would go on something like this: "Once upon a time there lived a little boy, and HE had a little sister. SHE was always happy when SHE was playing with HIM, and THEY used to have such jolly times together. One day THEY went into a wood WHICH was behind their father's house. Now, the wood was full of lions and tigers and Indians, and all sorts of awful things; but the good fairies took the brother and sister by the hand and led THEM along quite safely, till THEY came to a little house. What was their surprise to see that IT was made of cake and gingerbread, and all the windows were barley-sugar."

Now stop for a minute to take breath, and look back at the story that you are supposed to be telling. Do you see the little words that are printed in big capital letters? They are such little words, and yet they are very, very useful. Suppose there were not any of those little words; then see

how much longer and more clumsy the story would have been. You would have had to say something like this: "Once upon a time there lived a little boy, and the little boy had a little sister. The little sister was always happy when the little sister was playing with the little boy; and the little boy and the little sister used to have such jolly times together. (Is it not getting dreadful?) One day the little boy and the little sister went into a wood, and the wood was behind their father's house."

And so we should have to go on, using these long words over and over again instead of the nice short, easy ones that we used at first. Now, these little words, HE, SHE, IT, THEY, WHICH, are used instead of nouns, for nouns, and so they are called "for-nouns," only we like to seem clever and learned, and so we use the Latin word for "for," and that is PRO. So instead of calling them FOR-NOUNS, we call them PRO-NOUNS.

When I was at school I used to learn a little rhyme:

A PRONOUN is a word used instead of a NOUN,
As, James was tired and HE sat down.

But I like the next one better, because it is less like a grammar book:

HE, SHE, IT went out to tea,
And ate of tea-cakes not a few:
When asked their names, said, "WE are WE,
As sure as YOU are YOU."

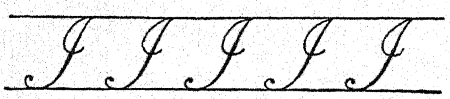
HE, SHE, IT had cousins too,
But did not take them out that day:
When asked, "How do your cousins do?"
Replied, "Oh, THEY are THEY!"

WRITING

CAPITAL I, J, C, E, AND G

"WE know fifteen letters, mother," said Nora, when she and Tom next sat down to their writing lesson. "That is more than half."

"And I hope we shall learn five more to-day," replied her mother. "Small i was easy to make, and capital I is easy. In writing letters to friends we often want to use it, for most letters have I in them somewhere; so we must make it well."



"Let the pen start making the loop between the two lines; bring it lightly round and up to the right, and then make a heavier down-stroke like that of T or F, or the first part of H or K. Now, Tom, see which of those four letters is most like I."

Tom looked at all five letters, and soon saw that T with the turn, not T like the T-square, was most like I.

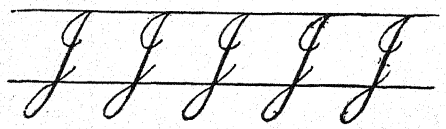
"But," said he, "T has a turn, and I has a loop. How can we remember, Nora?"

Nora put on her thinking-cap, and puzzled over it, till, happening to look down at her sleeve, she noticed a hook fastening it at the wrist by a loop made of cotton, not by an eye.

"Yes, Nora; that's it!" exclaimed her mother. "The eye has a loop."

"Now we shall know," said Tom, as he looked at Nora's sleeve, and saw that the loop bulged out like the curve of I from the down-stroke.

After practising the loop of I, the children were shown how to make its brother letter, a grown-up brother letter, as the children soon discovered.



"I has been growing a tail. Look! A tail like that of Y and Z."

Nora and Tom looked, and asked what the letter was.

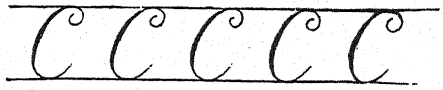
"Cousin Jack's letter," said their mother. "What do you think 'Jack' should begin with?"

Nora thought it must be J, because it sounded so like it, and she was quite right.

"And J comes next to I in the alphabet, you know, Nora," said Tom.

"You can think of I grown up into J with a tail," observed his mother. "There is a bird called a jay, which learns to talk like a parrot. As it has

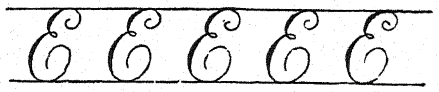
a tail, too, that will help in remembering J's tail. Here is a letter easy to recognize. What is it?" she asked, when the children had finished J, and she was writing C for them to copy.



Tom and Nora had hardly need to do more than glance at it. They knew it must be C, because it was so like little c, only, as Tom said, instead of starting at once with a little dot, it made a curled-up little tail to look more important, for it had to do something to show it was not a little c, but a big one.

Their mother said they must make it double the height of the little letter c, so that then it could not be confused with the small letter.

"Now," she said, when the children had finished writing it, "the next letter is a pretty one, full of curves, but it needs special care to make because it has so many turns. It is E."

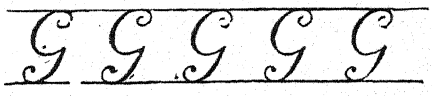


"What is the figure which is the same as a stroke, Tom?"

Tom answered "1," and his mother, holding up a piece of looking-glass so that E was reflected in it, asked, "And what is this?"

"Why, mother, it is a 3!" exclaimed Nora. "But only in the looking-glass," she added, as she and Tom began to copy their mother's letters.

They were shown how the upper curve started on the right below the upper line, went up and round to the left, and round and down to the right, and then repeated a bigger curve under the upper one, so that it had a curve above and a curve below. It wanted care to make the upper and lower parts nicely rounded, but when Tom and Nora had practised making it they were shown the fifth letter, G. Here it is:



"G," said their mother, "begins in the same way as E, but makes a bigger loop, and ends quite differently by a down-stroke which curves round to the left and ends in a dot. There is another way of making it, but this one is simple. Look at it well before beginning."

Tom and Nora knew by this time that if they did not look carefully first they were very likely indeed to make mistakes, so they had a good look at G before they set to work to copy it.

ARITHMETIC

THE WAY TO MULTIPLY BIG NUMBERS

ALTHOUGH we have learned to speak of "multiplying a number by 3," we must always remember that this is simply a short way of saying that we "add together three equal numbers." In writing the problem we write the number itself *once*, and the *multiplier* shows how many of these numbers we are adding together.

If I have 5 bags, and each bag contains 136 nuts, how many nuts have I altogether?

Here we have to find what the result would be if we wrote the number 136 five times, and added the five numbers together. To find this, we write 136 only *once*, and the *multiplier* 5, written under the unit's figure of 136, shows that we are adding *five* numbers, each of which is 136. Let us work it.

136
5

680

Say, five 6's, 30; put down 0, carry 3. Five 3's, 15, and 3, 18; put down 8, carry 1. Five 1's, 5, and 1, 6; put down 6.

Multiplication by any of the numbers from 2 to 9 is done in the same way as the examples we have already worked. We ought not to find any difficulty about it, since the process is just like addition; we find first what the units make, then the tens, and so on.

We now come to another important point. Suppose 4 children have 5 apples each. Altogether, there will be 4 times 5 apples. Next, if each of the children gives one of his apples to a fifth child, they will each have 4 apples left, and the fifth child will also have 4 apples.

Thus, we now have 5 children each

with 4 apples, so that, altogether, there are 5 times 4 apples. But, in all, there are just as many apples as there were before; so it is clear that

"Five times 4" is the same as "4 times 5."

The use of knowing this is seen in a question like the following:

A blacksmith uses 7 nails to fasten a horse-shoe. How many nails will he use to fasten 248 horse-shoes?

Evidently he will require 7 nails 248 times—that is, we want to know how many 248 times 7 make. At present this would perhaps be difficult to us; but when we remember that "248 times 7" is the same as "7 times 248" it is quite easy, because we know how to multiply 248 by 7. If we work this, we find the blacksmith requires altogether 1736 nails.

Examples

1. A market-gardener plants 254 cabbage-plants every day for 6 days. How many is that altogether?

2. Two hundred and fifty-seven boys each do 8 lines of writing. How many lines do they do altogether?

3. Forty-three girls have 5 pennies each, and 29 boys have 7 pennies each. How many pennies is that altogether?

First find how many the girls have, then how many the boys have, and add the two numbers together.

4. Multiply seven thousand two hundred and nine by nine, and write out the answer in words.

5. If 243 boys each have 3 marbles in one hand and 4 in the other, how many marbles have the boys altogether?

Let us multiply the number 34 by 10. If we use the same method as we have done for the numbers up to 9, we shall have:

34	Ten 4's, 40, carry 4.
10	Ten 3's, 30, and 4, 34.
340	

So that the answer is 340.

Now, 340 and 34 are very much alike. They each have a 3, followed by a 4. Then one of them has 0 following the 4.

Suppose we try to find the reason these numbers are so much alike.

	3	4

Using our "boxes" again for a while, the number 34 means that we have 4 things in the right-hand, or units, box, and 3 bundles of them in the tens box. Now, if we multiply this number by 10—that is, if we add together ten 34's—each "one" becomes a bundle of ten, each "ten" becomes "ten bundles of ten," or what we call a hundred. Thus, instead of 3 tens and 4 ones, we have 3 hundreds and 4 tens. Putting these into their proper boxes, we get a 3 on the hundreds box, a four on the tens box, and a 0 on the units box.

3	4	0

We see, then, that *to multiply a number by* 10 *we have only to put a* 0 *at the right of it.* For this means that the figure which stood for "ones" now stands for "tens," the figure which stood for "tens" now stands for "hundreds," and so on—that is, the number is ten times what it was

For example, 5894 multiplied by 10 is 58940.

320 multiplied by 10 is 3200.

THE ANSWERS TO THESE EXAMPLES ARE GIVEN ON PAGE 3170.

MUSIC

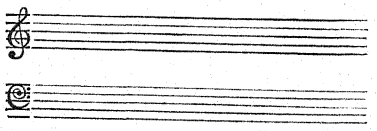
THE MAP WHICH THE FAIRIES MADE

WE now know where all our fairies and goblins live; we know their names, and we know how to make each one sing his or her little song; but sometimes two, or three, or four, or even more want to sing together.

And long ago the question arose in fairyland: "How can we make it possible for the children to see at a glance how to press down two, three, four, or even more of our little notes at the same time?"

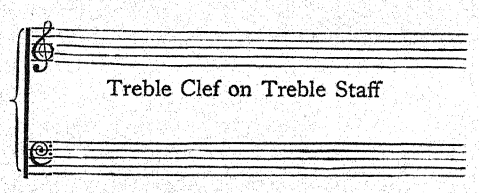
At last one of the little goblins spoke words of wisdom, and this is what he said: "Fairies and goblins all, we know that the Treble Road and the Bass Road appear as one very long line to the child who comes to see us in our magic kingdom, the piano. To look all along that line in a passing second of

time would be very difficult, and many signs would be wanted to show that those of us in the Treble Road are wanting to sing with our friends in the Bass Road. The only easy thing to do is to give everyone a curious sort of map, which we in fairyland know how to make. It will look as if the Treble Road were over the Bass Road, and as if the Bass Road lay under the Treble Road, just like this :

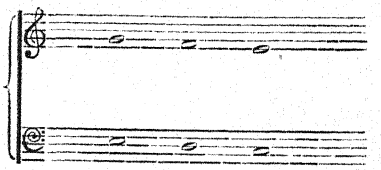


" Of course, as you see, Treble Clef must stand at the entrance of the Treble Road (or Treble Staff, as we know it is called), and Bass Clef must take up his stand at the entrance of the Bass Road. To show there is a reason for this curious map, and to tell the children of earth that the fairies and goblins in each road are going to give beautiful choruses instead of little solos, we must give them a new sign, like this : { It joins the roads together, and the children of men will call it a *brace*. So will they know that they must be clever enough to use two hands, and approach different notes with them at the same time."

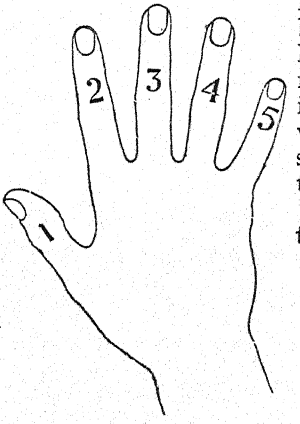
All the fairies and goblins thought this was a very clever idea, and they clapped their little hands, and fluttered their small wings, so that all who had " fairy ears " heard the most beautiful music, so exquisite that we can hardly imagine how really wonderful it was. This is the fairy map which has been made for you and me :



If we wait a little while longer, we shall see the fairies have taken up their places on the lines and in the spaces. Yes, here they are :

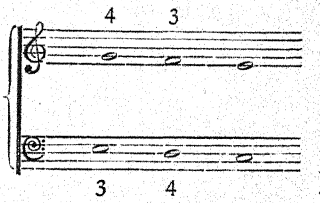


You see, Fairy G on the second line in the Treble Road and Fairy E in the third space in the Bass Road want to sing together ; so find Fairy G with the fourth finger on your right hand, and Fairy E with the third finger on your left hand, then press down very firmly, but gently, *quite together*, and we shall hear how nicely their voices blend. In case you are a little puzzled about the fingers of your hand, there is a picture on this page with the fingers all marked, so that it may be quite easy to make no mistakes.

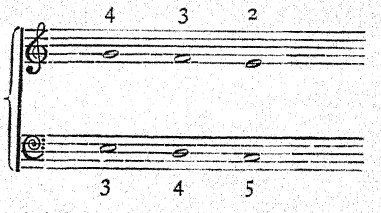


How we number our fingers.

Now we look at the next two notes :



F in the first space in the Treble Road wants to sing with D on the third line in the Bass Road. Again we must find our fairies, and we want the third finger on the right hand and the fourth finger on the left hand ; but we must approach them carefully, mind that they sing exactly together, and I know we shall think how very nice they both are. Just two more fairies left, and they are very anxious for us to hear them :

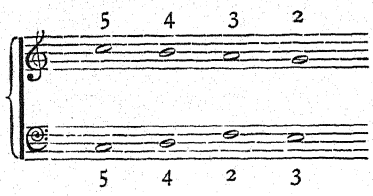


Fairy E on the first line in the Treble Road, waiting for the second finger of the right hand; Fairy C in the second space in the Bass, waiting for the fifth finger of the left hand.

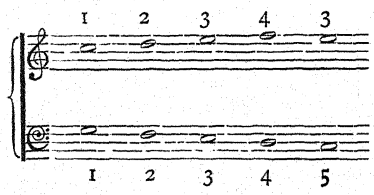
Do you not think it would be nice to play one or two games like this last one, so that we can see how quickly fairies can be found, even when they live in different roads, and how little time we need lose in thinking which fingers we want to use?

The merriest way to play our game is to make up our minds to find fairies and fingers by the time we have counted four, taking care to find the right ones.

THE FIRST GAME



THE SECOND GAME

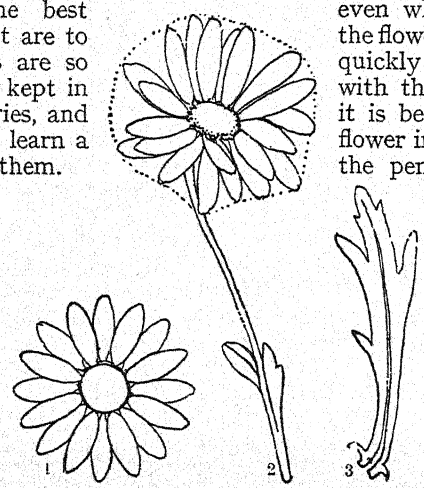


DRAWING

DRAWING AND PAINTING A DAISY

NOW that we know something about color and a little about pencil outline from plants, and about designing or making patterns, we will try and use all these together. We must remember that it is best to take simple things to copy, and to use only a few colors till we have grown clever with brush and pencil. It is better not to copy anybody else's drawings till we are big enough to go to places where only the best pictures and the best sculpture and ornament are to be seen; these things are so valuable that they are kept in museums and art galleries, and people who copy them learn a great deal that helps them.

The great artists who did this wonderful work were once little children who found straight lines and curves very difficult, and sometimes so tiresome that they felt inclined to give up. But they would not let themselves be beaten; they drew the things they saw all around them every day, taking the easy ones first, till they made pictures at which thousands of people still love to look, as they hang on the walls of our picture-galleries.



Pictures 2 and 3 show the daisy drawn from nature; 1 gives the "conventional" drawing.

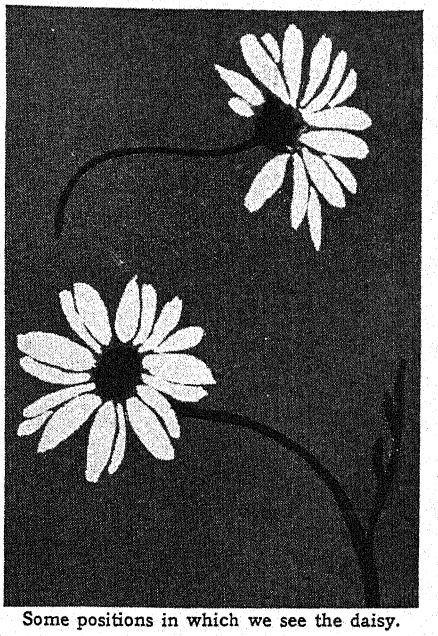
Let us get a flower with its leaves and buds, and our paints, and white and brown paper. We will try to copy the flowers first, using white paint for the flower and black for the leaves and stalks, painting it in as many different positions as possible. If we like, we can do it all in black paint on white paper, just to get an idea of the flower.

Flowers and leaves change so quickly that we have to work partly from memory even while we are looking at the flower. We can brush more quickly with the brush than with the pencil; that is why it is best to get to know the flower in brushwork first. For the pencil drawing, we must sketch in the general outline first, and not alter this at all till we come to finishing the drawing with a clear outline. If the flower changes so much that we cannot finish the first sketch, we must begin another.

Suppose we have managed the general outline—as it is shown in the dotted line in the illustration—sketching it in with the chisel-pointed pencil; we can then put in the yellow centre. Unless we are looking full at the flower, the

circle in the centre will alter as the jam-jar did; it will be oval—narrower as it comes near the level of the eye. The general outline has been drawn round the points of the white rays, which are also set in a circle, and this will narrow or widen as the centre one did, according to its nearness to or distance from the eye-level.

We will put in the principal white rays first, and then the others. Some are behind each other; some look shorter than others. We must look at each one carefully first before we draw it.



Some positions in which we see the daisy.

As soon as we have made a nice drawing, we can rub out the working lines, and put in the lines with a sharp-pointed pencil to give a good, clear outline. The lines for the stalk, the leaves, and the centre should be stronger than those for the white rays, but none of them should be heavy.

Now let us put all our drawings and the flowers away, and do some others from memory; then we can see how much we have remembered. Afterwards we will make what are called "conventional drawings" of the flower and leaves and buds. We get our idea from Nature, but we make rather stiff drawings with both sides alike, for we want this sort of drawing for decoration. In the ivy leaf we found a five-cornered shape. The proper name for that shape is pentagon, which means five corners. The daisy has a circle for its conventional shape. It looks nice in the middle of a square; but the corners must be filled up with leaves or buds, so that if the square outline were taken away we could still see that the pattern was meant for a square. Let us draw a little square tile, with each of its sides three inches long, and put a circle for the daisy of one inch and a half radius in the middle. We find the middle of a square by drawing lines from corner to corner. Then we can put in the daisy and leaves in the spaces, and paint the tile in three colors—yellow, orange, and green, leaving the flower of white.



The daisy and its leaves.

As the flower is to be left white, tne background must be painted. This is the most difficult part of the painting, and must always be done first; great care must be taken to keep the wash of color quite flat and to keep the edges of the pattern clean. We must remember that perfection only comes with practice, and that, though it is difficult, it can be done very nicely even by quite little children. We must keep trying, and take every chance we can of going to places where we can see other people's work, and if other little girls and boys are doing this drawing too, it will help us both to see each other's work, for we learn much by the mistakes of others.

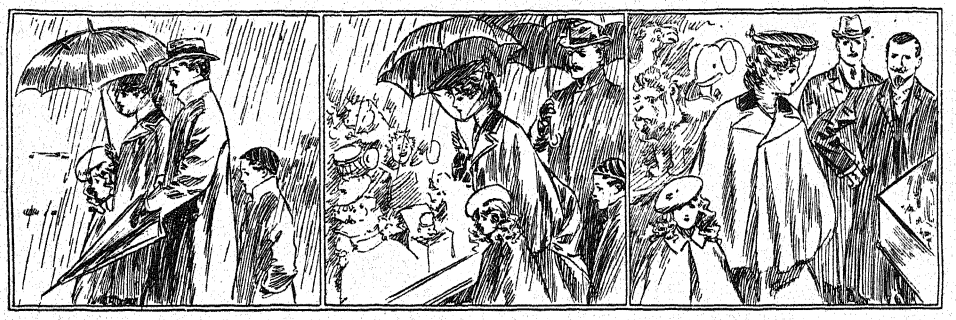
LITTLE PICTURE-STORIES IN FRENCH

First line: French. Second line: English words. Third line: As we say it in English.

Il pleut. Nous irons acheter des cadeaux pour les prendre chez nous.
It rains. We shall go to buy some presents for them to take to the house of us.
It is raining. We are going to buy presents to take home.

Nous trouvons nos parapluies, et nous sortons. Nous traversons la rue.
We find our umbrellas, and we set out. We traverse the street.
We find our umbrellas, and start out. We cross the street.

Il y a un magasin dans la prochaine rue où l'on vend de beaux joujoux.
It there has a shop in the next street where (the) one sells some beautiful toys.
There is a shop in the next street where beautiful toys are sold.



Nous entrons tous. Le commis dit : " Qu'est-ce que madame désire ? "
We enter all. The shopman says : " What is this that madam desires ? "
We all go inside. The shopman says : " What can I do for you ? "

" Nous désirons acheter des cadeaux. Combien coûte cette poupée ? "
" We desire to buy some presents. How much costs this doll ? "
" We wish to buy some presents. How much is this doll ? "

" Quinze francs, madame." " C'est trop. Montrez-moi d'autres poupées."
" Fifteen francs, madam." " That is too much. Show me some other dolls."
" Fifteen francs, madam." " It is too much. Show me some others."

" Puis-je avoir celle-ci dans la robe bleue pour la cousine Elsie ? " dit Jeannette.
" May I to have this here in the robe blue for the cousin Elsie ? " says Jenny.
" May I have this one in the blue frock for cousin Elsie ? " says Jenny.



Nous achetons la poupée, et je choisis des soldats pour mon ami Jean.
We buy the doll, and I choose some soldiers for my friend John.
We buy the doll, and I choose some soldiers for my friend John.

Puis nous choisissons des chaises pour la maison de poupées d'Annette.
Then we choose some chairs for the house of dolls of Annette.
Then we choose some chairs for Annette's dolls' house.

" Il fait du soleil," dit Jeannette. " Allons nous promener."
" It makes of the sun," says Jenny. " Let us go ourselves to promenade."
" The sun is shining," says Jenny. " Let us go for a walk."

THE NEXT SCHOOL LESSONS BEGIN ON PAGE 3167.

THE POETRY OF SHAKESPEARE

AS William Shakespeare, the greatest of all poets, wrote chiefly for the stage, his poetry taking the form of great dramatic pieces to be spoken and acted on the stage, we find in his works few short complete poems. Though he did not write for children, his plays may be enjoyed by old and young alike, and we have already read the stories of many of these, beginning at page 327. Here we give a selection of songs from his plays, and some passages from these which are suitable for the "Book of Poetry." Ariel's song from "The Tempest" is on page 331.

SONGS FROM SHAKESPEARE

CONTINUED FROM 2826

THE FAIRY LIFE

From "A Midsummer Night's Dream."

OVER hill, over dale,
Through bush, through brier,
Over park, over pale,
Through flood, through fire,
I do wander everywhere,
Swifter than the moon's sphere;
And I serve the fairy queen,
To dew her orbs upon the green;
The cowslips tall her pensioners be;
In their gold coat spots you see;
Those be rubies, fairy favours,
In those freckles live their savours;
I must go seek some dewdrops here,
And hang a pearl in every cowslip's ear.

A WINTER SONG

From "Love's Labour's Lost."

WHEN icicles hang by the wall,
And Dick the shepherd blows his nail,
And Tom bears logs into the hall,
And milk comes frozen home in pail,
When blood is nipp'd, and ways be foul,
Then nightly sings the staring owl,
To-who;
Tu-wit, to-who, a merry note,
While greasy Joan doth keel the pot.

When all aloud the wind doth blow,
And coughing drowns the parson's saw,
And birds sit brooding in the snow,
And Marian's nose looks red and raw,
When roasted crabs hiss in the bowl,
Then nightly sings the staring owl,
To-who;
Tu-wit, to-who, a merry note,
While greasy Joan doth keel (cool) the pot.

UNDER THE GREENWOOD TREE

From "As You Like It."

UNDER the greenwood tree,
Who loves to lie with me;
And tune his merry note
Unto the sweet bird's throat.
Come hither, come hither, come hither;
Here shall he see
No enemy,
But winter and rough weather.

Who doth ambition shun,
And loves to live i' the sun;
Seeking the food he eats,
And pleased with what he gets.
Come hither, come hither, come hither;
Here shall he see
No enemy,
But winter and rough weather.

THE WINTER WIND

From "As You Like It."

BLOW, blow, thou winter wind,
Thou art not so unkind
As man's ingratitude;
Thy tooth is not so keen,
Because thou art not seen,
Although thy breath be rude.
Heigh-ho! sing heigh-ho! unto the green holly:
Most friendship is feigning, most loving mere folly:
Then, heigh-ho, the holly!
This life is most jolly.

Freeze, freeze, thou bitter sky,
That dost not bite so nigh
As benefits forgot;
Though thou the waters warp,
Thy sting is not so sharp
As friends remembered not. [holly:
Heigh-ho! sing heigh-ho! unto the green
Most friendship is feigning, most loving mere folly:
Then, heigh-ho, the holly!
This life is most jolly.

A FAIRY LULLABY

From "A Midsummer Night's Dream."

YOU spotted snakes, with double tongue,
Thorny hedgehogs, be not seen;
Newts and blind-worms, do no wrong;
Come not near our fairy queen.
Weaving spiders, come not here;
Hence, you long-legg'd spinners, hence;
Beetles black approach not near;
Worm, nor snail, do no offence.
Philomel, with melody,
Sing in our sweet lullaby:
Lulla, lulla, lullaby, lulla, lulla, lullaby:
Never harm, nor spell, nor charm,
Come our lovely lady nigh;
So, good-night with lullaby.

ORPHEUS AND HIS LUTE

From "King Henry VIII."

ORPHEUS with his lute made trees,
And the mountain-tops that freeze,
Bow themselves when he did sing:
To his music, plants and flowers
Ever sprung; as sun and showers
There had made a lasting spring.

Everything that heard him play,
Even the billows of the sea,
Hung their heads, and then lay by.
In sweet music is such art,
Killing care and grief of heart
Fall asleep, or hearing, die.

THE FALL OF CARDINAL WOLSEY

ONE of the greatest characters in the long roll of English history is Cardinal Wolsey, who was the foremost man in the kingdom during the earlier reign of King Henry VIII. He was a tyrant, unjust in many ways, but a patriot for all that; and when the king dismissed him from his high office, it is thus that Shakespeare, in the play of "King Henry VIII.," imagines him to have received the crushing blow. The Cromwell mentioned is not Oliver Cromwell, of course, as he lived later, but Wolsey's secretary.

WOLSEY: Farewell, a long farewell, to all my greatness!
This is the state of man; to-day he puts forth
The tender leaves of hope; to-morrow blossoms,
And bears his blushing honours thick upon him:
The third day comes a frost, a killing frost;
And—when he thinks, good, easy man, full surely
His greatness is a-ripening—nips his root.
And then he falls, as I do. I have ventured,
Like little wanton boys that swim on bladders,
This many summers in a sea of glory;
But far beyond my depth: my high-blown pride
At length broke under me; and now has left me,
Weary, and old with service, to the mercy
Of a rude stream, that must for ever hide me.
Vain pomp, and glory of this world, I hate ye;
I feel my heart new opened: O, how wretched
Is that poor man that hangs on princes' favours!
There is, betwixt that smile we would aspire to,
That sweet aspect of princes, and their ruin,
More pangs and fears than wars or women have;
And when he falls, he falls like Lucifer,
Never to hope again.

Enter CROMWELL.

Why, how now, Cromwell?

CROMWELL: I have no power to speak, sir.

WOLSEY: What, amazed
At my misfortunes? Can thy spirit wonder
A great man should decline? Nay, an you weep,
I am fallen indeed.

CROMWELL: How does your Grace?

WOLSEY: Why, well;
Never so truly happy, my good Cromwell.
I know myself now; and I feel within me
A peace above all earthly dignities,
A still and quiet conscience. The king has cured me,
I humbly thank his Grace; and from these shoulders,
These ruin'd pillars, out of pity, taken
A load would sink a navy, too much honour;
O, 'tis a burden, Cromwell, 'tis a burden,
Too heavy for a man that hopes for heaven.

. . . . . .

Go, get thee from me, Cromwell;
I am a poor fallen man, unworthy now
To be thy lord and master: Seek the king;
That sun, I pray, may never set! I have told him
What, and how true thou art: he will advance thee;
Some little memory of me will stir him
(I know his noble nature), not to let
Thy hopeful service perish too. Good Cromwell,
Neglect him not; make use now, and provide
For thine own future safety.

CROMWELL: O, my lord,
Must I then leave you? Must I needs forego
So good, so noble, and so true a master?
Bear witness, all that have not hearts of iron,
With what a sorrow Cromwell leaves his lord.
The king shall have my service; but my prayers
For ever and ever shall be yours.

WOLSEY: Cromwell, I did not think to shed a tear
In all my miseries; but thou hast forced me,
Out of thy honest truth, to play the woman.
Let's dry our eyes: and thus far, hear me, Cromwell;
And—when I am forgotten, as I shall be;
And sleep in dull, cold marble where no mention
Of me more must be heard of—say, I taught thee,
Say, Wolsey—that once trod the ways of glory,
And sounded all the depths and shoals of honour—
Found thee a way, out of his wreck, to rise in;
A sure and safe one, though thy master miss'd it.
Mark but my fall, and that that ruin'd me.
Cromwell, I charge thee, fling away ambition:
By that sin fell the angels; how can man, then,
The image of his Maker, hope to win by't?
Love thyself last: cherish those hearts that hate thee;
Corruption wins not more than honesty.
Still in thy right hand carry gentle peace,
To silence envious tongues. Be just and fear not.
Let all the ends thou aim'st at be thy country's,
Thy God's, and truth's; then if thou fall'st, O Cromwell,
Thou fall'st a blessed martyr. Serve the king;
And—prythee, lead me in:
There take an inventory of all I have,
To the last penny; 'tis the king's: my robe,
And my integrity to heaven, is all
I dare now call mine own. O Cromwell, Cromwell,
Had I but served my God with half the zeal
I served my king, He would not in mine age
Have left me naked to mine enemies.

THE GREAT SPEECH OF MARK ANTONY

THIS is one of the most famous speeches written by Shakespeare, in whose plays there are many fine speeches. It is spoken by Antony, the friend of Julius Cæsar, over the dead body of that Roman ruler after the plot to murder Cæsar had been carried out. Antony sought to regain the people to the side of Cæsar's friends. The play is called "Julius Cæsar."

FRIENDS, Romans, countrymen, lend me your ears;
I come to bury Cæsar, not to praise him.
The evil that men do lives after them;
The good is oft interred with their bones;
So let it be with Cæsar. The noble Brutus
Hath told you Cæsar was ambitious:
If it were so, it was a grievous fault;
And grievously hath Cæsar answer'd it.
Here, under leave of Brutus, and the rest,
(For Brutus is an honourable man;
So are they all, all honourable men):
Come I to speak in Cæsar's funeral.
He was my friend, faithful and just to me;
But Brutus says he was ambitious,
And Brutus is an honourable man.
He hath brought many captives home to Rome,
Whose ransoms did the general coffers fill:
Did this in Cæsar seem ambitious?
When that the poor have cried, Cæsar hath wept;
Ambition should be made of sterner stuff:
Yet Brutus says he was ambitious,
And Brutus is an honourable man,
You all did see, that on the Lupercal,
I thrice presented him a kingly crown,
Which he did thrice refuse. Was this ambition?
Yet Brutus says he was ambitious;
And, sure, he is an honourable man.
I speak not to disprove what Brutus spoke,
But here I am to speak what I do know.
You all did love him once, not without cause;
What cause withholds you, then, to mourn for him?
O judgment, thou art fled to brutish beasts,
And men have lost their reason! Bear with me;
My heart is in the coffin there with Cæsar,
And I must pause, till it come back to me.

. . . . . .

But yesterday, the word of Cæsar might
Have stood against the world: now lies he there,

THE FRIEND OF THE DEAD CÆSAR PRAISING HIM TO THE ROMANS



After Julius Cæsar had been killed, the conspirators explained their action to the people. Brutus spoke and the mob was pleased. Then Antony, the friend of Cæsar, praised the murdered ruler and showed his body. The people now turned to Antony's side, and here we see Brutus and Cassius—who wears a helmet—turning away from the angry people. The picture is by the French artist Court, photographed by Neurdein.

And none so poor to do him reverence.
O masters, if I were disposed to stir
Your hearts and minds to mutiny and rage,
I should do Brutus wrong, and Cassius wrong,
Who, you all know, are honourable men:
I will not do them wrong; I rather choose
To wrong the dead, to wrong myself, and you,
Than I will wrong such honourable men.
But here's a parchment, with the seal of Cæsar,
I found it in his closet, 'tis his will:
Let but the commons hear this testament,
(Which, pardon me, I do not mean to read),
And they would go and kiss dead Cæsar's wounds,
And dip their napkins in his sacred blood;
Yea, beg a hair of him for memory,
And, dying, mention it within their wills,
Bequeathing it, as a rich legacy,
Unto their issue.

. . . . . .

If you have tears, prepare to shed them now.
You all do know this mantle: I remember
The first time ever Cæsar put it on;
'Twas on a summer's evening, in his tent;
That day he overcame the Nervii:
Look! In this place ran Cassius' dagger through:
See, what a rent the envious Casca made:
Through this the well-beloved Brutus stabb'd;
And, as he pluck'd his cursed steel away,
Mark how the blood of Cæsar follow'd it;
As rushing out of doors, to be resolv'd
If Brutus so unkindly knock'd, or no;
For Brutus, as you know, was Cæsar's angel:
Judge, O you gods, how dearly Cæsar loved him!
This was the most unkindest cut of all;
For when the noble Cæsar saw him stab,
Ingratitude, more strong than traitors' arms,
Quite vanquished him: then burst his mighty heart;
And, in his mantle muffling up his face,
Even at the base of Pompey's statue,
Which all the while ran blood, great Cæsar fell.
O, what a fall was there, my countrymen!
Then I, and you, and all of us fell down,
Whilst bloody treason flourish'd over us.
O, now you weep; and, I perceive, you feel
The dint of pity: these are gracious drops.
Kind souls, what, weep you, when you but behold
Our Cæsar's vesture wounded? Look you here,
Here is himself, marr'd, as you see, with traitors.
Good friends, sweet friends, let me not stir you up
To such a sudden flood of mutiny.
They that have done this deed are honourable;
What private griefs they have, alas, I know not,
That made them do it; they are wise and honourable,
And will, no doubt, with reasons answer you.
I come not, friends, to steal away your hearts;
I am no orator, as Brutus is:
But, as you know me all, a plain, blunt man,
That love my friend; and that they know full well
That gave me public leave to speak of him.
For I have neither wit, nor words, nor worth,
Action, nor utterance, nor the power of speech,
To stir men's blood: I only speak right on;
I tell you that which you yourselves do know;
Show you sweet Cæsar's wounds, poor, poor dumb mouths,
And bid them speak for me. But were I Brutus,
And Brutus Antony, there were an Antony
Would ruffle up your spirits, and put a tongue
In every wound of Cæsar, that should move
The stones of Rome to rise and mutiny.

THE SHEPHERD'S HAPPY LIFE

IN the play of "King Henry VI.," the king, at the battle of Towton, is supposed to utter these thoughts, and no doubt many a king in time of trouble has envied his humblest subject. Shakespeare's power is seen in thus expressing the emotions of his characters.

O GOD! methinks it were a happy life,
To be no better than a homely swain;
To sit upon a hill, as I do now,
To carve out dials quaintly, point by point,
Thereby to see the minutes, how they run:
How many make the hour full complete,
How many hours bring about the day,
How many days will finish up the year,
How many years a mortal man may live.
When this is known, then to divide the times:
So many hours must I tend my flock;
So many hours must I take my rest;
So many hours must I contemplate;
So many hours must I sport myself;
So many days my ewes have been with young;
So many weeks ere the poor fools will yean;
So many years ere I shall shear the fleece.
So minutes, hours, days, weeks, months, and years,
Pass'd over to the end they were created,
Would bring white hairs unto a quiet grave.
Ah, what a life were this! how sweet! how lovely!
Gives not the hawthorn bush a sweeter shade
To shepherds, looking on their silly sheep,
Than doth a rich embroider'd canopy
To kings that fear their subjects' treachery?
O, yes, it doth: a thousand-fold it doth.
And to conclude—the shepherd's homely curds,
His cold, thin drink out of his leather bottle,
His wonted sleep under a fresh tree's shade;
All which secure and sweetly he enjoys,
Is far beyond a prince's delicates,
His viands sparkling in a golden cup,
His body couched in a curious bed,
When care, mistrust, and treason wait on him.

A GREAT DAY FOR ENGLAND

SHAKESPEARE'S plays are full of stirring scenes, noble deeds, and fine thoughts, though we cannot print many of these here, and not all would be understood by boys and girls. But every boy and girl loves a brave man, a fearless warrior, and Henry V. was such as Shakespeare shows him to us. In the play of "King Henry V.," the scene is the English camp at Agincourt, in France, just before the famous battle, described in Drayton's poem on page 2743. Some of Henry's generals are discussing the outlook, and the Earl of Westmoreland is wishing they had "but one ten thousand of those men in England, who do no work to-day," when the king himself comes up and says:

WHAT'S he that wishes so?
My cousin Westmoreland?—No, my fair cousin:
If we are marked to die, we are enough
To do our country loss; and if to live,
The fewer men, the greater share of honour.
God's will! I pray thee, wish not one man more.
By Jove! I am not covetous for gold;
Nor care I who doth feed upon my cost;
It yearns me not, if men my garments wear;
Such outward things dwell not in my desires;
But, if it be a sin to covet honour,
I am the most offending soul alive.
No, 'faith, my coz, wish not a man from England:
God's peace! I would not lose so great an honour,
As one man more, methinks, would share from me,
For the best hope I have. O, do not wish one more; [my host,
Rather proclaim it, Westmoreland, through
That he who hath no stomach to this fight,
Let him depart; his passport shall be made,
And crowns for convoy put into his purse.
We would not die in that man's company,
That fears his fellowship to die with us.
This day is called the feast of Crispian:
He that outlives this day, and comes safe home,
Will stand a-tiptoe when this day is named,
And rouse him at the name of Crispian.
He that shall live this day, and see old age,
Will yearly on the vigil feast his friends,
And say to-morrow is Saint Crispian:
Then he will strip his sleeve, and show his scars,
And say, these wounds I had on Crispian's day.
Old men forget: yet all shall be forgot.
But he'll remember, with advantages,
What feats he did that day! Then shall our names,
Familiar in their mouths as household words—
Harry the King, Bedford and Exeter,
Warwick and Talbot, Salisbury and Gloster,
Be in their flowing cups freshly remember'd.
This story shall the good man teach his son;
And Crispin Crispian shall ne'er go by,
From this day to the ending of the world,
But we in it shall be remembered;
We few, we happy few, we band of brothers:
For he, to-day, that sheds his blood with me
Shall be my brother; be he ne'er so vile,
This day shall gentle his condition:
And gentlemen in England, now a-bed,
Shall think themselves accursed, they were not here;
And hold their manhood cheap, while any speaks,
That fought with us upon Saint Crispian's day.

THE NOBLEST ROMAN

From "Julius Cæsar."

Brutus was one of the Romans who leagued to kill Cæsar, but Antony, Cæsar's friend, is made to say these things of him after he is dead and defeated.

THIS was the noblest Roman of them all:
All the conspirators, save only he,
Did that they did in envy of great Cæsar;
He, only, in a general honest thought,
And common good to all, made one of them.
His life was gentle; and the elements
So mix'd in him, that Nature might stand up,
And say to all the world, *This was a man!*

THE LESSON OF THE HONEY BEES

From "King Henry V."

There are many useful lessons which we may learn by studying the lives of animals and insects. Here is what the honey bees can teach us, according to Shakespeare.

SO work the honey bees;
Creatures that, by a rule in Nature, teach
The act of order to a peopled kingdom.
They have a king, and officers of sorts:
Where some, like magistrates, correct at home;
Others, like merchants, venture trade abroad;
Others, like soldiers, armed in their stings,
Make boot upon the summer's velvet buds;
Which pillage they with merry march bring
To the tent-royal of their emperor; [home
Who, busied in his majesty, surveys
The singing masons building roofs of gold;
The civil citizens kneading up the honey;
The poor mechanic porters crowding in
Their heavy burdens at his narrow gate;
The sad-ey'd justice, with his surly hum,
Delivering o'er to executors pale
The lazy, yawning drone.

IN PRAISE OF ENGLAND

From "Richard II."

THIS royal throne of kings, this scepter'd isle,
This earth of majesty, this seat of Mars,
This other Eden, demi-paradise;
This fortress, built by Nature for herself
Against infection, and the hand of war;
This happy breed of men, this little world;
This precious stone set in the silver sea,
Which serves it in the office of a wall,
Or as a moat defensive to a house,
Against the envy of less happier lands;
This blessed plot, this earth, this realm, this England.

From "King John."

This England never did, nor never shall,
Lie at the proud foot of a conqueror. . . .
Come the three corners of the world in arms,
And we shall shock them: Nought shall make us rue
If England to itself do rest but true.

A FATHER'S ADVICE TO HIS SON

From " Hamlet "

Polonius, an aged courtier, thus advizes his son, the manly and fearless Laertes, how to behave himself when he goes on a visit to France. See the story of the play on page 449.

GIVE thy thoughts no tongue,
Nor any unproportioned thought his act.
Be thou familiar, but by no means vulgar.
Those friends thou hast, and their adoption tried,
Grapple them to thy soul with hoops of steel;
But do not dull thy palm with entertainment
Of each new-hatched, unfledged comrade. Beware
Of entrance to a quarrel; but, being in,
Bear it, that the opposer may beware of thee.
Give every man thine ear, but few thy voice;
Take each man's censure, but reserve thy judgment.
Costly thy habit as thy purse can buy,
But not express'd in fancy; rich, not gaudy:
For the apparel oft proclaims the man;
And they in France, of the best rank and station,
Are most select and generous, chief in that,
Neither a borrower, nor a lender be:
For loan oft loses both itself and friend;
And borrowing dulls the edge of husbandry.
This above all—To thine own self be true;
And it must follow, as the night the day,
Thou canst not then be false to any man.

MAN'S GREATEST TREASURE

From " King Richard II."

THE purest treasure mortal times afford
Is spotless reputation; that away,
Men are but gilded loam, or painted clay.
A jewel in a ten-times-barr'd-up chest
Is a bold spirit in a loyal breast.
Mine honour is my life; both grow in one;
Take honour from me, and my life is done:
Then, dear my liege, mine honour let me try;
In that I live, and for that will I die.

THE WAYWARD DAUGHTER'S FATE

From " Two Gentlemen of Verona "

NO, trust me; she is peevish, sullen, froward,
Proud, disobedient, stubborn, lacking duty;
Neither regarding that she is my child,
Nor fearing me as if I were her father:
And, may I say to thee, this pride of hers,
Upon advice, hath drawn my love from her;
And where I thought the remnant of mine age
Should have been cherish'd by her child-like duty,
I now am full resolved to take a wife,
And turn her out to who will take her in;
Then let her beauty be her wedding dower;
For me and my possessions she esteems not.

A MAN'S GOOD NAME

From " Othello "

GOOD name in man and woman, dear my lord,
Is the immediate jewel of their souls;
Who steals my purse steals trash; 'tis something—nothing;
'Twas mine, 'tis his, and has been slave to thousands;
But he that filches from me my good name,
Robs me of that which not enriches him,
And makes me poor indeed.

THE QUALITY OF MERCY

From " The Merchant of Venice "

Portia, who speaks these words, is pleading for mercy to one she loves, a fine man, Antonio, who is under the power of a bad Jew named Shylock. See story of the play on page 330.

THE quality of mercy is not strained;
It droppeth, as the gentle rain from heaven
Upon the place beneath; it is twice bless'd—
It blesseth him that gives, and him that takes.
'Tis mightiest in the mightiest: it becomes
The thronèd monarch better than his crown;
His sceptre shows the force of temporal power,
The attribute to awe and majesty,
Wherein doth sit the dread and fear of kings;
But mercy is above this sceptred sway,
It is enthronèd in the hearts of kings,
It is an attribute to God Himself;
And earthly power doth then show likest God's,
When mercy seasons justice. Therefore, Jew,
Though justice be thy plea, consider this—
That in the course of justice, none of us
Should see salvation: we do pray for mercy;
And that same prayer doth teach us all to render
The deeds of mercy.

FRIENDS AND FLATTERERS

From verses written to Music

EVERY one that flatters thee,
Is no friend in misery.
Words are easy, like the wind;
Faithful friends are hard to find.
Every man will be thy friend,
Whilst thou hast wherewith to spend;
But if store of crowns be scant,
No man shall supply thy want.
If that one be prodigal,
Bountiful they will him call:
And with such-like flattering,
" Pity but he were a king."
But if fortune once do frown,
Then farewell his great renown:
They that fawn'd on him before
Use his company no more.
He that is thy friend indeed,
He will help thee in thy need,
If thou sorrow, he will weep;
If thou wake, he cannot sleep:
Thus of every grief in heart
He with thee doth bear a part.
These are certain signs to know
Faithful friend from flattering foe.

THE LIGHT OF OUR VIRTUES

From " Measure for Measure "

THYSELF and thy belongings
Are not thine own so proper as to waste
Thyself upon thy virtues, they on thee.
Heaven doth with us as we with torches do;
Not light them for themselves; for if our virtues
Did not go forth of us, 'twere all alike
As if we had them not. Spirits are not finely touched
But to fine issues, nor Nature never lends
The smallest scruple of her excellence;
But, like a thrifty goddess, she determines
Herself the glory of a creditor,
Both thanks and use.

THE SEVEN AGES OF MAN

WE have to remember always what kind of person Shakespeare makes the speaker of any of his famous thoughts, as the words always suit the one that speaks them. Jacques, who is made to utter these words in "As You Like It" (see page 637), was somewhat gloomy in his mood. A "pard" is a leopard, a "capon" is a tender chicken, and "sans" is the French word for "without," but is sometimes used as an English word.

ALL the world's a stage,
And all the men and women merely players:
They have their exits, and their entrances;
And one man in his time plays many parts,
His acts being seven ages. At first, the infant,
Mewling and puking in the nurse's arms;
And then the whining schoolboy, with his satchel,
And shining morning face, creeping like snail
Unwillingly to school; And then, the lover,
Sighing like furnace, with a woeful ballad
Made to his mistress' eyebrow: Then a soldier,
Full of strange oaths and bearded like the pard,
Jealous in honour, sudden and quick in quarrel,
Seeking the bubble reputation
Even in the cannon's mouth; And then, the justice,
In fair round belly, with good capon lined,
With eyes severe, and beard of formal cut,
Full of wise saws and modern instances,
And so he plays his part: The sixth age shifts
Into the lean and slipper'd pantaloon;
With spectacles on nose, and pouch on side;
His youthful hose well saved a world too wide
For his shrunk shank; and his big manly voice,
Turning again toward childish treble, pipes
And whistles in his sound: Last scene of all,
That ends his strange, eventful history,
Is second childishness, and mere oblivion;
Sans teeth, sans eyes, sans taste, sans everything.

WISE SAYINGS FROM SHAKESPEARE

HOW far that little candle throws its beams!
So shines a good deed in a naughty world.
"Merchant of Venice"

And oftentimes, excusing of a fault
Doth make the fault be worse by the excuse.
"King John"

O! it is excellent
To have a giant's strength; but it is tyrannous
To use it like a giant.
"Measure for Measure"

But 'tis a common proof
That lowliness is young ambition's ladder,
Whereto the climber—upward turns his face:
But when he once attains the upmost round,
He then unto the ladder turns his back,
Looks in the clouds, scorning the base degrees
By which he did ascend.
"Julius Cæsar"

Cowards die many times before their deaths;
The valiant never taste of death but once.
Of all the wonders that I yet have heard,
It seems to me most strange, that men should fear;
Seeing that death, a necessary end,
Will come when it will come.
"Julius Cæsar"

There is a tide in the affairs of men,
Which, taken at the flood, leads on to fortune;
Omitted, all the voyage of their life
Is bound in shallows, and in miseries.
On such a full sea are we now afloat;
And we must take the current when it serves,
Or lose our ventures.
"Julius Cæsar"

How oft the sight of means to do ill deeds,
Makes ill deeds done!
"King John"

I dare do all that may become a man;
Who dares do more, is none.
"Macbeth"

To be a queen in bondage is more vile
Than is a slave in base servility;
For princes should be free.
"King Henry VI."

Life every man holds dear; but the brave man
Holds honour far more precious dear than life.
"Troilus and Cressida"

To gild refined gold, to paint the lily,
To throw a perfume on the violet,
To smooth the ice, or add another hue
Unto the rainbow, or with taper-light
To seek the beauteous eye of heaven to garnish,
Is wasteful, and ridiculous excess.
"King John"

If all the year were playing holidays,
To sport would be as tedious as to work;
But when they seldom come they wish'd for come,
And nothing pleaseth but rare accidents.
"King Henry IV."

What stronger breastplate than a heart untainted!
Thrice is he armed that hath his quarrel just;
And he but naked, though lock'd up in steel,
Whose conscience with injustice is corrupted.
"King Henry VI."

At Christmas I no more desire a rose,
Than wish a snow in May's new-fangled mirth;
But like of each thing that in season grows.
"Love's Labour's Lost"

Our doubts are traitors,
And make us lose the good we oft might win,
By fearing to attempt.
"Measure for Measure"

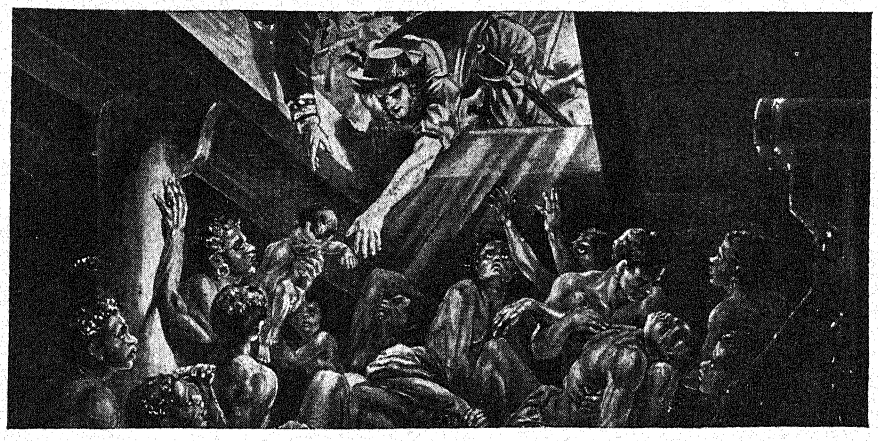
A friend should bear his friend's infirmities.
"Julius Cæsar"

ÆSOP THE SLAVE TELLING HIS FABLES



All the world has been delighted by the fables which Æsop told to the Greeks 2,500 years ago. We cannot learn much about Æsop, but we know that he was a slave, and, it is said, that he was so deformed that for a long time no one would buy him. But at last he was bought, and his master found him so wise that he set him free. Here we see the famous story-teller delighting an audience of Greek ladies with some of his fables.

The photograph of Bishop Crowther on page 2937 is by Lyddell Sawyer.



SLAVES WHO BECAME FAMOUS

CONTINUED FROM 2797



IN the ancient days there was no country in the world in which there were not a great number of slaves; in most countries there were more slaves than there were free people. Men owned other men, just as they owned cattle, and these slaves always had to obey their masters.

Nowadays employees are not slaves, but are as free as other people, and simply work for employers in return for wages, and food, and other things. If they disobey orders, all that can happen to them is that they are dismissed and go away to another employer. They cannot be punished, because they are free people, whom the laws protect. But in the days when workers were slaves, the laws of the land did not protect them against their owners. If anyone hurt or killed another man's slave, he had to pay the slave's value to the other man; but if the owner beat his own slave, or even in some countries if he killed him, he had merely damaged some of his own property, and that was the end of the matter. We have learned to know that it is very wrong to think of any of our fellow men and women as being the property of others; yet not long ago Christian folk with white skins thought it was quite right to own human beings with black skins.

But in the ancient days, before Christianity had come into the world at all, anyone who said that it was wrong to have slaves would only have been laughed at. At first, when one nation or tribe went to war with another, the captives, who were carried off to be slaves, were often the most valuable part of the spoils, and conquerors nearly always made slaves of the conquered people. They might settle down in the country, and let the conquered people live on as their slaves, or they might carry them off captive, or perhaps sell them in other countries.

Sometimes, too, roving bands of robbers would seize people and carry them off to be sold in this way, to be the slaves of masters in a foreign land. It must have been a terrible and cruel thing for anyone to be snatched away from his home and his friends, and forced to obey the commands of a master who might treat him as he chose. Still, masters were often kind to their slaves, especially to those who served them in their own houses. For most people would rather be kind than cruel; and, beside that, servants

who were treated kindly would be both able and willing to do their work better than those who hated their owners. So it came to pass that there were sometimes slaves who found favor with their masters, and rose from slavery to freedom and prosperity. And here we are to read about some men who, although they had been made slaves, or perhaps were even born in slavery, have made a great mark in the world.

THE LAD WHO WAS SOLD FOR A SLAVE AND BECAME A PRIME MINISTER

First of all, there is one about whom we know already; a little lad whose father was so fond of him that all his elder brothers were jealous, and what made it worse was that he told them his dreams, in which he saw them all bowing down to him. So first they resolved to kill him, and then they thought of a better plan, since they did not quite like the idea of killing their own brother. They sold him to a band of Ishmaelites, who carried him off to the land of Egypt, and they, in turn, sold him for a slave to the captain of the king's guard, whose name was Potiphar.

Joseph was a slave when the Ishmaelites sold him, but presently Potiphar found him so clever and useful that he set him over all his house. Yet Joseph was still a slave, so that when Potiphar was angry with him he could throw his slave into prison. But we who have read the Bible know how he was taken out of prison when Pharaoh, king of Egypt, found that he could interpret dreams that had been sent as a warning, and how he became the ruler of the land of Egypt, or, as we might say, Pharaoh's prime minister. That is the oldest story we know of a slave rising to be a ruler of nations.

THE SLAVE-BABY THAT GREW UP TO BE THE WORLD'S GREATEST LAW-GIVER

And then we remember how, after a time, all the children of Israel were made slaves in Egypt—not slaves of this master or the other, but slaves of the State—and were cruelly driven to do all manner of hard work. But when one little slave-baby was born, his mother hid him in an ark, or tiny boat, where the king's daughter and her maidens found him when they went to bathe. And the slave-baby was brought up as though he had been the son of the princess herself. And in after years, he was chosen to lead the children of Israel out of Egypt to the Promised Land, and became the greatest law-giver the world has ever known. Moses was actually born a slave. There are folk who say that once upon a time there was even a slave dynasty, a family descended from slaves, who reigned in Egypt, because a nation who had been made slaves by the Egyptians, like the Israelites, got arms and rose up against the Egyptians, and set up one of themselves to be king. After they had been kings for a long time they were overthrown again. But we know nothing definite about any such thing.

Next, we have two men who became famous in quite another way. About one of them there are many stories. This was a Greek, and we all know his name, for we read in this book many of the fables that were told by Æsop the slave. The story runs that, when two Greek cities were at war with each other, the little boy who was called Æsop was carried off prisoner and made a slave. But he was so clever and witty that his master had him well taught, and after many years set him free.

HOW ÆSOP THE SLAVE REPROVED THE WISE MAN OF ATHENS

Æsop had lived among slaves, and then he lived among people who were free, and was taken into counsel by wise men and rulers of states. In another part of this book, on page 1321, we read about one of the wisest of the Greeks, called Solon, who visited Crœsus, the king of Lydia. Well, they say that Æsop was at the court of Crœsus just at that time, and that he reproved the wise Solon for lack of courtesy to so great a king as Crœsus.

So we may see how important a man the slave must have become. And there are two other stories about him, which cannot both be true. One says that he was ugly and deformed, which made it all the more notable that one who was a slave and deformed, too, should have had such pleasant and kindly fancies as we see in his fables. The other story says that a statue was set up in his honor, and it seems hardly likely that the Greeks would ever have thought that they were doing honor to a man whose shape was ugly and contemptible, by setting up a statue of him; so, after all, it may be that life was not doubly hard for poor Æsop; for being

a slave was quite hardship enough to have taken all the fun out of most men's lives.

Among the Greeks and Romans it was quite a common thing for slaves who served in their master's houses to earn enough money to buy their freedom. Sometimes they continued in the service of the same master as "freed-men," and had slaves of their own. The cruel Emperor Nero, the first who persecuted the Christians, had a freed-man called Epaphroditus, and Epaphroditus had a slave who is always called Epictetus.



Joseph's wonderful story in the Bible has fascinated us all. The hatred of his brothers, how they sold him to Arab slave dealers, his adventures as a slave in Egypt, his interpretation of Pharaoh's dream, and his elevation to be prime minister of the kingdom, all form one of the most romantic stories in history.

This picture is reproduced by permission of Sir Lawrence Alma-Tadema, the artist.

Though Epaphroditus had once been a slave himself, he was not a kind master, and Epictetus had a great deal to bear. In his slavery he learned to feel that, though the body may be in bondage, the soul is free, and that bodily pain and suffering are of no account as compared with the freedom of the soul. For he may always be happy who acts righteously because it is his will and desire to act righteously. And when, after a time, Epictetus got his own freedom from slavery, he taught other men to understand the wise thoughts that had come to him; and became a famous philosopher and teacher. Although, like the great Greek philosopher Socrates, he wrote no books, one of his pupils, who is called Arrian, wrote down what Epictetus had taught him. The wisest of the Romans, like the great and noble Emperor Marcus Aurelius, accounted the slave Epictetus as their master in wisdom; so that, until they learned that the truths of Christianity are higher and deeper than anything that was understood even by the wisest of the pagans, there was none who helped them more to know the wisdom of righteousness than Epictetus, who had been a slave.

But even when all the Roman world had come to profess Christianity, slavery did not cease; and the great Emperor Justinian had an adviser, who may have come as a slave from Armenia. His name was Narses. Now, Narses was a sort of cripple, so that both men and women made mock of him, as though he were hardly a man at all, and he was brought up to serve among the women. Yet Justinian found out that he was a very shrewd and able man after all,

and step by step he reached high office.

What was stranger still, Justinian found that Narses could give the very wisest of counsel in war, so that when the barbarian tribes called Goths had made themselves almost masters of Italy —for the Roman emperor in those days ruled not at Rome, but at Byzantium, which we now call Constantinople—and one of the greatest of all soldiers, Belisarius, had much ado to vanquish the Goths, Narses was sent to give counsel to Belisarius. And some time later, when Belisarius himself was recalled, Narses was sent to be the general of the Roman armies. So great was his skill that some historians account him a commander greater even than Belisarius. He smote the Goths, and won back Italy, so that it was once more for a time altogether under the sway of the Roman emperor.

THE SLAVES WHO MARCHED TO THE MOUNTAINS AND BEAT THE ROMAN ARMIES

So far we have talked only of slaves who won their freedom and rose to fame; and now we have the story of a slave who made a glorious fight for freedom for himself and many other slaves. For the Romans had thousands upon thousands of slaves who worked for them, not in their houses, but on their great estates, and these were slaves indeed, for whose well-being there was none to care—they were owned body and soul by their masters. And there were others, captives who had been taken in war, who were kept that they might make sport for the Roman people by fighting as gladiators in the circus. Now, there was a certain Spartacus, a mountaineer from the land of Thrace, who had been made a prisoner, and was set among the gladiators.

But Spartacus had no mind to be a slave; and he stirred up the other gladiators, who were strong men and fierce, and skilled with their weapons, to band together and fight for their freedom rather than to make sport for the Roman crowd. And, seeing that none were more skilled in arms than Spartacus, they chose him for their leader; and they rose up with the weapons that had been given them for fighting in the arena, and marched away into the mountains, from whence they made raids into the country —for we must remember that they had all been born enemies of the hated Romans. When the Romans sent armies against them, those armies were overthrown; and in all those parts the slaves fled from their masters and joined Spartacus and his gladiators, so that Spartacus soon had a fine army behind him.

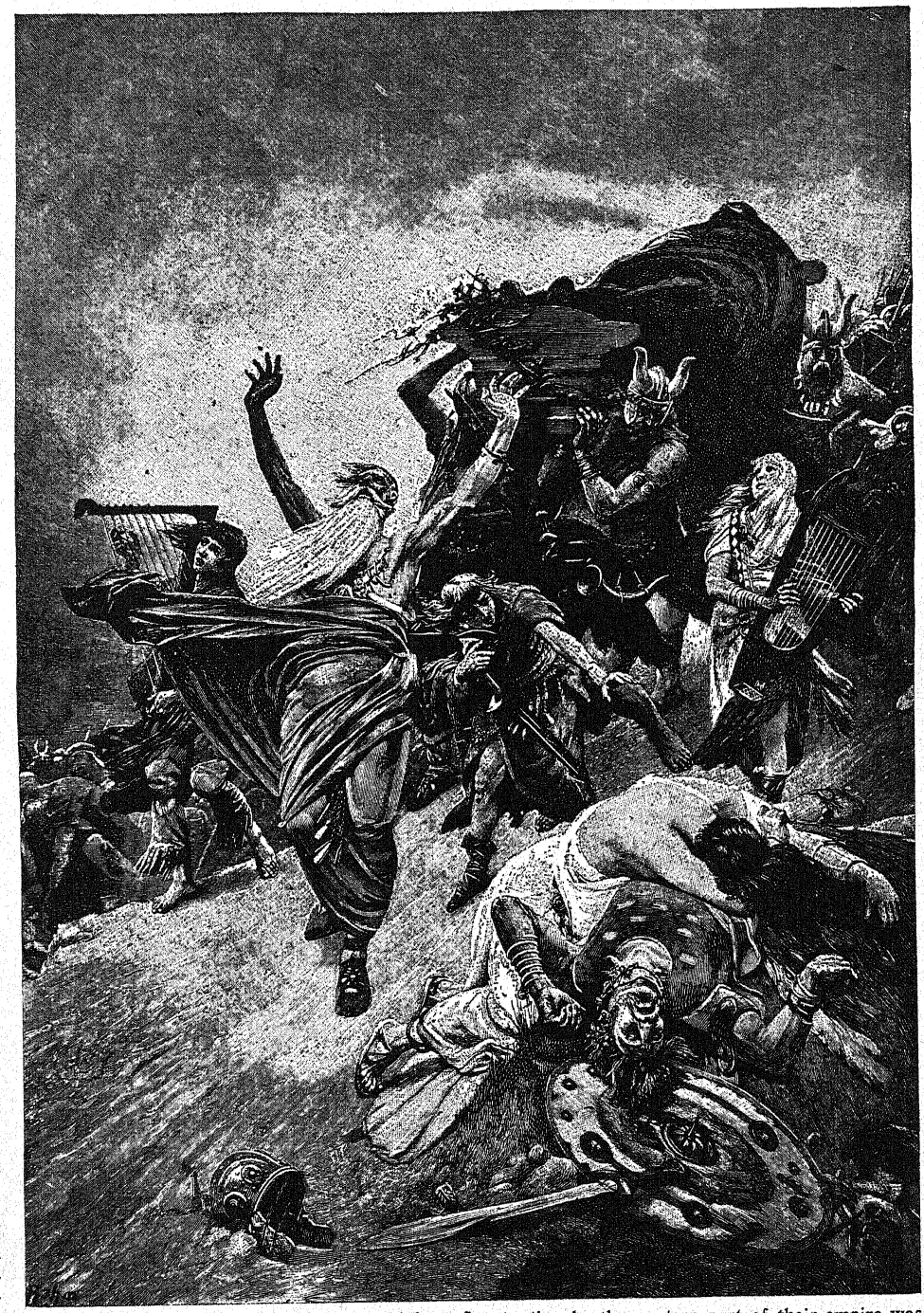
HOW THE GREAT SLAVE LEADER SPARTACUS WAS SLAIN IN BATTLE

Now, it was the desire of Spartacus that they should march out of Italy and go back to their own people in Germany or Thrace, or elsewhere; and when they marched through Italy they overthrew, one after another, the armies that the Romans sent against them. But then the followers of Spartacus deemed that they might altogether overthrow the might of Rome, and though Spartacus himself knew that to be but a vain imagination, he would not desert them, but abode with them, being resolved at least to make a valiant fight of it. And so at last the Romans sent against him an army so great that the slaves were overwhelmed altogether by numbers, despite their valor and the skill of their leader; and Spartacus was slain fighting, sword in hand. But as for the slaves who were not slain in the battle, they were cruelly put to death by the Romans to the number of 6,000, as slaves who had insolently rebelled against their masters, for whom there should be no mercy at all.

THE GREAT ARMY OF SLAVES THAT RULED EGYPT FOR 400 YEARS

We have seen how it is said that there was in Egypt an ancient dynasty of people who had been slaves and made themselves kings. Something of that kind happened in Egypt after the days of the great Sultan Saladin. For the sultans who ruled in Egypt had gathered together many slaves, white Circassians and brown Turks, making with the men regiments of soldiers, called Mamelukes, which means slaves; and the Mamelukes, under their captain, Aibek, made themselves lords of Egypt, and one or another of the Mamelukes was sultan of Egypt for some hundreds of years thereafter. And in India there was once a great emperor, named Shahab-ud-Din, who had a Turcoman slave called Kubn-ed-Din. And when Shahab-ud-Din found that Kubn-ed-Din was a wise man and brave, he made him ruler over a great

A SLAVE DRIVES BACK ROME'S ENEMIES



When the Roman emperors ruled the world from Constantinople, the western part of their empire was overrun again and again by the Goths, who carried ruin wherever they went. At last, the Emperor Justinian appointed as commander of the Roman armies in Italy a feeble and crippled old man named Narses. All the world laughed when they heard that the once mighty Roman legions were to be led by a decrepit old man of 75, who had formerly been a despised slave. But they did not laugh long. Narses, although old and feeble, was a man of vigorous mind, and a brilliant general, and he defeated the Goths, and drove them right out of Italy. In this picture we see the Goths retreating after their defeat by Narses at Mount Vesuvius in 553. They are carrying with them the body of their king, slain in battle.

province; and after Shahab-ud-Din was dead, Kubn-ed-Din ruled the province as a kingdom of his own, and was the first ruler of the slave dynasty of Delhi.

HOW A NEGRO BOY WAS MADE A SLAVE, AND AFTERWARDS BECAME A BISHOP

Slavery existed not only in the ancient world, but in the modern world. It is little more than a hundred years since the nations of Europe resolved to stop the work of the slave traders, who captured negroes—men and women and children—in Africa, and carried them off to be slaves in Mohammedan countries, or in America. About a hundred years ago a party of slave traders seized all the people in an African village, among whom there was a little boy named Adjai. They were all brought down to the coast to be shipped off to become slaves; but a British warship caught the slave-ship, and set the slaves free, as shown in the picture on page 2937. They had no home to go to, so they were taken to the British colony of Sierra Leone, where they were taught Christianity. Little Adjai was baptized, and after that he was called Samuel Crowther; and he soon became so earnest a Christian that he resolved to be a missionary. And he did his work as a missionary so well that before he died the little slave boy had become a bishop, the head of the Christian community throughout Nigeria.

There are still living to-day men who were born in slavery. Booker T. Washington died only in 1915. He was born a slave in the United States; for though the slave trade had been stopped, there were thousands and thousands of negro slaves in America, where many negroes were slaves, and the children of slaves were slaves also.

THE GREAT JOY OF THE AMERICAN SLAVES WHEN THEY WERE SET FREE

But because many people in the northern states said slavery must cease, there was a great civil war in the United States.

Booker T. Washington has told us, in the story of his life, how the news of the final victory of the North was received on the estate where he, a boy at the time, and his mother and brothers and sisters were slaves. The slaves were all summoned to the house of their owner. The family were assembled on the verandah, and there an army officer read out the glorious news that all the slaves were free and that their freedom should never be taken from them.

"My mother, who was standing by my side," writes Mr. Booker Washington, "leaned over and kissed her children, while tears of joy ran down her cheeks. She explained to us what it all meant, that this was the day for which she had been so long praying, but fearing that she would never live to see."

Now that they were free, the slaves felt that they must go away somewhere, if only for a little time, so that they might know that it was not all a dream, that they really were free. But many of them returned to the plantations to work for wages, for the masters whom they had served as slaves.

THE SLAVE BOY WHO BECAME A BRILLIANT SCHOLAR & HEAD OF A FAMOUS SCHOOL

Booker Washington had no father, but his stepfather was living, hundreds of miles away, and the whole family set out to join him. Their few possessions were carried in a little cart. Booker and his brothers and sisters tramped the whole weary way on foot. When they reached their new home, Booker was sent to school. All the scholars were asked their names, and gave Christian name and surname. Now, Booker had never had any name but Booker, but he felt that, like the rest of the boys, he must have *two* names, so without hesitation, he answered, "Booker Washington," and by that name he has ever since been known.

His schooldays were few. He had to go to work in a coal-mine to help to keep the family; but after working hard all day he studied at night, and made such splendid progress that at last he was able to go to a school.

It was the Hampton Institute in Virginia to which he went, and in order to earn his fees he had to act as porter at the school, and, during the holidays, go out to work as a waiter. He proved a good student, and was later appointed teacher at the Hampton Institute; and when a school for negroes was started at the town of Tuskegee, in Alabama, he was placed in charge. His skill as a teacher and his own character as a man have made it one of the most famous in the whole world.

THE NEXT MEN AND WOMEN BEGIN ON 3023.



THE OLD COUPLE AT THE MILL

CONTINUED FROM 2893

AN old man and his wife, who lived in a little cottage on a hillside, seemed unable ever to agree. They were always quarreling and jangling, and they became the talk of the villagers.

If the old man said a rook was black, his wife declared that it was white; if the woman said a cow was brown, the man would insist that it was black; and so it went on day after day.

At last their jangling was heard in Fairyland, and one of the little old men of the wood determined to put a stop to the quarreling. If the couple did not cease of their own accord, he said, then they should have a lesson which would make them agree.

But the cottager and his wife did not stop their silly quarrels.

At last one day, when they wanted some corn ground, they put the sack in an old-fashioned hand-cart, and started to wheel this to the mill that stood on top of the hill.

"You are not pulling at all, husband," said the woman, as she pushed the cart behind.

"What do you mean, wife?" shouted the husband from the front. "Why, it is I who am getting the cart uphill. You are not pushing at all, and I believe that you are hanging on the cart into the bargain."

So they went on, and their jangling did not lighten the load. At last they managed to get the cart up the hill, and, wheeling it to the door of the mill, unloaded the sack and carried it in.

Then they went outside to look at the sails going round, and the man stood in front of the mill, while his wife went round to the back.

"Look at the sails!" shouted the husband. "They are going round in the opposite direction to the sun!"

"What do you mean?" cried his wife. "They are going with the sun!"

"You obstinate woman!" said the man. "Anyone can see that the sails are going against the sun."

Of course, both were right, for while one was looking at the top of the sails, the other was looking at the bottom.

"Ah," thought the little man of the woods, "now is my time to teach them a lesson." So when the man cried out angrily for the tenth time, "Cannot you see that the wings are going against the sun?" the little gnome prompted him to seize hold of a sail.

Of course, the woman answered back, and the sly gnome prompted her also to catch hold of one of the sails.

The man and woman were unable to stop the sails, and so were carried round; but after they had gone up a little way they could hold on no longer, and fell with a bang to the ground.

"Oh," said the man, rubbing his poor head, "didn't that hurt!"

"Yes," said the wife, also rubbing her bruises, "that it did."

Then they limped into the mill, got their flour, and trundled it off home in the cart, agreeing together for the first time—that the fall from the mill had hurt them. But as they had agreed once, they found it easier to agree again, and then again, until at last a more loving couple could not be found.

THE PRINCESS WHO BECAME A GOOSE GIRL

A BEAUTIFUL Princess was to be married to a Prince whom she had never seen.

All preparations were made for the wedding, and the time came when the Princess had to bid farewell to her mother. The Queen was very sad at this parting, for the Prince's kingdom was so far away that she might never see her daughter again.

As they were saying good-bye, the Queen pricked her finger so that three drops of blood fell on to her handkerchief. Giving it to her daughter, she said:

"Carry this with you wherever you go, and no harm can ever befall you."



The Princess became a goose girl, and spent her days tending the geese.

The Princess thought this strange, but she obeyed, and soon set out with her maid to the land where the Prince lived.

Before they had gone far the Princess began to feel very thirsty.

"Please fetch me some water from the brook," she said to the maid.

But the maid answered rudely:

"I shall not. Get it yourself."

The Princess made no reply, but alighted from her horse, drew the water, and rode on again. And the handkerchief said:

"If your mother knew, it would break her heart."

By-and-by the Princess said again:

"I am thirsty. Please fetch me some water."

But the maid answered:

"You may fetch it yourself. I am not going to be your maid."

Again the Princess made no reply, but alighted from her horse and drew the water. And the handkerchief said:

"If your mother knew, it would break her heart."

The Princess wept, and the handkerchief fell from her hand into the brook.

Then the maid, who knew that the handkerchief could no longer protect her mistress, said:

"Give me your dress, and take mine. We will change places. Take my horse, and I shall take your horse, Falada. I shall marry the Prince, and everyone must think that I am the Princess. If you refuse, I shall kill you."

The Princess was so terrified that, to save her life, she consented, and they rode on. Presently they came to the palace, and the maid was treated as the Princess, and the Princess as the maid. As the poor Princess stood, sad and alone, in the courtyard, the King looked out of the window, and saw her.

"Do you want work?" he asked kindly.

"Yes, please," answered the Princess. "I want a girl to help my lad, Kurd-

chen, to tend the geese," said the kindly King, "and if you would like to stay here you may be my little goose girl."

And so the Princess became a goose girl, and spent her days with Kurdchen, tending the geese.

Now, the wicked maid was afraid that the horse Falada might tell the King all that had happened, so she ordered his head to be cut off. But the Princess loved Falada, and she persuaded Kurdchen to hang its head over the kitchen door, and every day as she went out she would say to it:

"Do you know who I am, Falada?"

And the head would answer her:

"You are the Princess. If your mother knew, it would break her heart."

One day the Princess let down her golden hair while Kurdchen was by. The lad was so struck with its beauty that he wanted to cut off a lock for himself. But the Princess refused, and this made him so angry that he ran to the King and told him that she was a witch.

When the King heard the story of the talking head that hung over the door and the goose girl's beautiful golden hair, he wondered what it all meant. The next day he sent for her.

The Princess entered the palace and appeared before the King, who was so impressed with her beauty and grace that he asked:

"Who are you?"

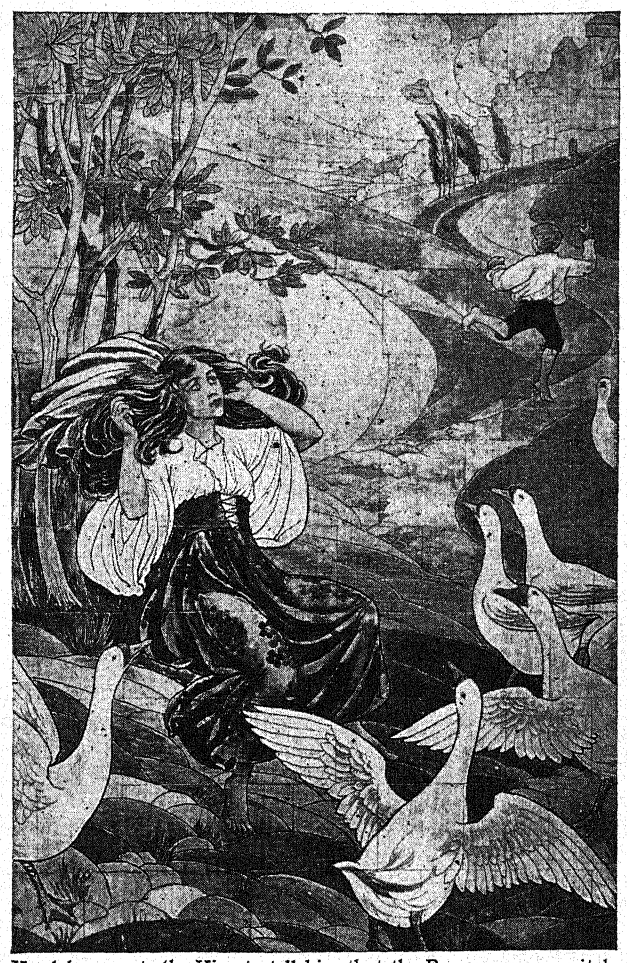
"Alas! I dare not say," she replied. "I have sworn to tell no one, and if I break my word I shall be killed."

Then the King said:

"I am the King of all this land. No one shall hurt you. Tell me all, and I will protect you."

The Princess burst into tears.

"I am the real Princess who was to marry your son, the Prince," she said; "but my maid took away my dress and my horse because she wished to marry him herself, and she threatened to kill me if I told anyone. If my mother knew, it would break her heart."



Kurdchen ran to the King to tell him that the Princess was a witch.

"Do not be afraid," said the King, who had long suspected the maid and knew at once that this was really the Princess.

The King comforted her, had her dressed in royal robes, and sent for the Prince. She looked so beautiful and happy that the Prince immediately fell in love with her, and they were married that very day. A great feast was prepared, to which all the people of the Court were invited, and there was much rejoicing and merry-making, because the true Princess had married the Prince. The wicked maid was severely punished, as she well deserved, and banished from the country, and the Prince and Princess lived happily ever after.

THE CAT AND THE PARROT

MADAME THÉOPHILE was a sandy cat of whom a French writer, Théophile Gautier, tells us this charming story:

She had a white chest, a pink nose, and blue eyes; she was called Madame Théophile because she dwelt with me on the most friendly terms, sleeping at the foot of my bed, dreaming on the arm of my chair while I wrote, descending to the garden to follow me in my walks, assisting at my meals, sometimes even intercepting a morsel of food which I might be carrying on my fork to my mouth.

One day a friend of mine, who was going away for a few days, confided to my care his parrot. The bird, feeling himself transported to a strange land, climbed by means of his beak to the top of his perch, and, sitting there silent and trembling, rolled around him eyes full of alarm.

Madame Théophile had never seen a parrot, and this creature, so new to her, evidently caused her immense surprize. As motionless as an embalmed cat from Egypt, she regarded the bird with an air of profound meditation, putting together all the notions of natural history which she had been able to gather on the tiles, in the courtyard, and the garden. The shadow of her thoughts passed across her blinking eyes, and I could read there, quite as well as if she had spoken out with her voice, this summing up of her examination:

"Decidedly this strange creature cannot be a green fowl."

Arrived at this decision, the cat got down from the table where she had established her observatory, and went and crouched in a corner of the room, stomach on the ground, the elbows protruded, the head low, the spring of the spine extended—like a cunning panther watching gazelles who have come from their homes to quench their thirst at a lake.

The parrot followed these movements with a feverish anxiety; he bristled his feathers, rattled his chain, lifted an agitated foot, and sharpened his beak on the edge of his feeding-tin. Instinct told him that an enemy was contemplating some kind of wickedness.

As for the eyes of the cat, fixed upon the bird with a fascinated intensity, they said, in a language which the parrot perfectly well understood, and which had nothing in the least uncertain about it: "Although green, this chicken ought to be good eating."

I followed this scene with interest, ready to interfere when occasion called. Madame Théophile had drawn nearer to the parrot; her pink nose quivered, she half closed her eyes, opened and shut her claws. Little thrills ran up and down her spine; like a greedy man sitting down before a delicious truffled pullet, she delighted herself with the thought of the succulent and rare meal which she was about to make. This foreign dish, so new to her and yet so tempting, tickled her appetite.

Suddenly her back bent like a stretched bow, and one elastic jump took her to the foot of the perch. The parrot, realizing his danger, with a voice low and solemn, said suddenly:

"Have you breakfasted, James?"

This phrase caused the cat an indescribable terror, and she sprang back. A flourish of trumpets, a smash of plates and dishes, a pistol fired at the ear, could not have given her a more frantic terror. All her ideas of birds were reversed. Her face expressed clearly the staggering thought that had suddenly come to her:

"This is not a bird; this is a gentleman. He speaks!"

Then the parrot began to sing, with a great shout in his voice which was perfectly deafening, for he had realized that the fright caused by his speech was his best means of defence.

The cat threw towards me a hurried glance of interrogation, and, my reply not satisfying her, she buried herself under the bed, from which it was impossible to make her move an inch all the day long.

Next day, a little more courageous, Madame Théophile ventured to make another timid attack, but with the same fortune as had met her the last time.

From that moment she threw up the sponge, and accepted the green bird as a man who must be treated with respect.

THE NEXT STORIES BEGIN ON PAGE 2953.



THE BREAD BY WHICH WE LIVE

CONTINUED FROM 2831



THERE is no other food which requires so much to be said about it as milk does, but there are several others about which we must learn. There can be no doubt that the next best food is bread, "the staff of life," as it is called. So if we have milk and bread or bread and milk, we have everything that the body requires, while neither contains any poisonous or injurious things.

There is special reason at the present time to understand the facts of bread, because the history of the part of mankind to which we belong —the history of the white races—has now reached a great crisis. What is called Western civilization, to which we belong, is really built up on bread, as contrasted with Eastern civilizations, which are built mainly upon rice. Wheat is vastly superior to rice as an article of diet, but some parts of the world have outrun their wheat supply. England long ago outgrew the wheat supply of that country, and lives on wheat from abroad, the larger part of which comes from the United States or Canada. It is possibly true that before many of the children who read this book have grown up there will be no more wheat sent from the United States, for this country may need every grain for our own use.

Bread has already grown much dearer, and will, no doubt, remain dear. There is no food known, whether produced by Nature or put together by men of science in the laboratory, that can replace wheat as the food of Western peoples. And therefore this wheat problem—first discussed by Sir William Crookes, who has since been justified in everything he said—is one of the greatest problems of the age, and it is our business here to study the facts of wheat in order that when we grow up to be men and women, and have this tremendous question to face, we may be properly prepared for the task.

When it was said in the Bible that "all flesh is grass," the words could be applied in more senses than one. The existence of the human race, as a whole, to-day depends upon grass. We read on page 2728 that for every human being there is required on the average a certain area of green leaves working for a certain number of hours a day. Now, it is the green leaves of grass that do this work for us. If we stand in the sun, we only get warm or hot and uncomfortable; we can make no starch or sugar by its power, but the grass can, and the particular grasses upon which man-

kind lives are called cereals. We eat not the leaves, but the fruits or seeds of these grasses, the food matter in which has been made by the leaves.

The first practical point to notice about this cereal food is its cheapness. There is really nothing else to compare with it for this. So little of our labor is needed, after all, to produce it; the plant itself is so capable a worker. Roughly speaking, a vegetable food has only about one-fourth the cost of animal food, and bread made of wheat is the cheapest of all foods. This reckoning is made not by outside weight, but by the weight of what, in the bread, is actually food and used as food. Comparisons by mere weight are absurd, for you may be weighing water or woody fibre or bone. The nearest food to rival the bread, for cheapness, is oatmeal. The contrast between bread and meat is really astonishing. Three cents' worth of bread contains eight ounces of dry food material, but if you spent that amount on meat you would hardly get two ounces. Further, good wheat flour is cheaper than all other foods, if we reckon its proteid only, and we know how tremendously important proteid is. Bread is much dearer than flour, but even bread, so far as its proteid is concerned, is still cheaper than milk, meat, or eggs.

BREAD, ONE OF THE BEST AND CHEAPEST FOODS THAT WE CAN BUY

The difference in price between flour and bread is so great as to make it a pity, except from the baker's point of view, that people no longer bake at home nearly so much as they used to do. A recent writer has said that bread is one of the cheapest foods not only with regard to the actual weight, but also with regard to the variety of the nourishment contained; and the purchaser who expends his modest five or ten cents on a well-cooked loaf may rest assured that he could not spend his money to better advantage, except, perhaps, in the purchase of oatmeal, which is slightly cheaper. But wheat flour is cheaper than oatmeal, so that by buying flour we are spending our money to better advantage still.

Just as we find that a given kind of milk is perfectly composed for the needs of the young creature for which it was made, so we find that the wheat plant does its work perfectly for its own needs. This is to say that the wheat grain consists partly of the germ of the young plant and of material supplied for it to live upon. This material is, indeed, almost an exception to the rule that milk is the only ready-made food designed by Nature. The source of energy for the future plant constitutes the greater part of the wheat grain, and it mainly consists of starch. Thus, flour or bread contains an excess of starch in proportion to its proteid, and a deficiency of fat.

THE BEST KIND OF LOAF THAT WE CAN EAT

These facts lend further point to the deep saying "man cannot live by bread alone." As flour or bread is rather lacking in proteid and fat, we see good sound reason for our practice of eating bread with cheese or butter.

The science of bread-making is really one of national importance. It is possible to treat the wheat grain in such a fashion that practically nothing gets into the flour but the starch. This produces an extremely white loaf, much admired by those who know no better. The whitest loaf is the starchiest and the least rich in proteid. In general, we should prefer a cream-colored loaf to a pure white one. It is the germ of the grain that is the really living part. It is in it, therefore, that we find the proteid which every living thing contains. By recent methods of bread-making, what is called "germ-bread" is produced, which means that the germ that used to be lost is saved for the flour. By eating such bread together with water, man could probably live for a long time. In any case, about four-tenths of a loaf is water, though, even so, bread is much less watery than raw meat.

THE DIFFERENCE BETWEEN BROWN BREAD AND WHITE BREAD

The covering of the wheat grain is called bran. The bran and the germ contain coloring matter, and if they are used we get a brown bread. Many people suppose that brown bread is superior, and this has been argued on scientific grounds. But brown bread is very much wetter, so that we are paying a good deal for water; and, in the second place, for some people the bran, which is woody, interferes with the

digestion of the food materials in the flour. Therefore the proteid of brown bread is not always absorbed as it should be, and the bran even interferes with the absorption of other things, such as milk. This is quite contrary to what is generally believed, but that makes it all the more necessary and important for us to know it.

WHY WE SHOULD EAT CRUSTS, AND WHY STALE BREAD IS BETTER THAN NEW

The crust of bread is more valuable than the crumb, simply because the crumb is so largely water. It is very wasteful indeed not to eat our crusts. Quite apart from the richness of the crust in food material, there is the fact that biting it is good for the teeth. This is especially true of children's teeth, and one of the real and deep reasons why our teeth are so bad nowadays is that they were not properly exercised when they were young. As we have seen twenty times already, there is no living power or structure that will not be injured if its work is done for it. I do not know which of these two reasons for eating crusts is the more important, but when I consider how much our teeth count for in the health and happiness of our whole lives, I am inclined to think that the great value of crusts lies in the work which they give the teeth.

If we cook bread and turn it into toast or rusks, or if we make crackers, we produce a very nourishing kind of food which is also much more digestible than ordinary bread because it is much drier. When we eat the crumb of new bread, we find it difficult to digest because it can scarcely be chewed and because it is so wet. If it is very wet, it cannot suck up the juices of the mouth. Now, we have already learnt that the digestion of starch and the turning of it into sugar partly depends upon the saliva, and bread is a very starchy food. We should therefore take it stale, or in the form of toast, biscuits, or crusts. These are so dry that they soak up the saliva of our mouths if we are careful to chew them well.

SOME OF THE GREAT QUESTIONS THAT WE HAVE TO CONSIDER ABOUT WHEAT

If we follow these simple rules, our teeth our stomachs, our purses, and our whole lives will profit. We should always buy bread made of "seconds" flour, not "patents." The seconds flour is richer in proteid, but happens to be darker, and the craze for whiteness, which means starchiness, in bread leads us to think it inferior.

As we all know, wheat can be grown in Europe, but the amount that is grown is not sufficient to feed the people. Now, there is no wealth but life and what makes and serves life. If, then, any part of that continent which might be growing wheat is growing grain from which to make alcohol, or is used for the preservation of game, which is trivial as a source of national food supply, then the people are failing to make wealth where they might. Also, it is their duty not only to grow wheat where they can, but to grow it as intensely as they can. Modern study of plant life is teaching how to increase enormously the output of the cereals, partly by proper treatment of the soil, and partly by passing electricity through electric wires suspended on poles a few feet above the soil. Lastly, it is possible to grow kinds of wheat which will resist disease, such as the wheat disease called "rust"; that will produce a flour that has all the good qualities for bread-making; and it is to be hoped that a wheat may also be grown that will produce a larger number of grains on each stalk than it is possible to get now.

HOW THE OLD WORLD LIVED ON RICE AND THE NEW WORLD LIVES ON WHEAT

These are a few of the great questions at which many wise men are working who know the facts about the probably approaching end of the American wheat supply and about the absolute necessity of wheat for national existence.

In recent times a good many special preparations have been made from wheat. Some of them, which are largely advertized under fancy names, have malt added to them, which aids the digestion, and they can scarcely be overpraised. True wheat flour is also disguised under such names as semolina, vermicelli, and macaroni.

We have seen that wheat is the best of all the grasses upon which mankind feeds, but there are others of very great importance. There is, for instance, rice, upon which the ancient civilizations of the earth are founded. Rice is not very digestible; it contains a great deal of starch and much less proteid than wheat. It is improbable that

Western civilization, with its great activity, could be maintained upon rice rather than wheat. It may well be that on rice there is possible only the more slowly moving life of the East. Of course, these things are not certain, nor have we the right to say that our activity and restlessness are always wise, but it is probable that the great food differences play the chief part in this matter. It is best to cook rice by steaming, and of course we should try to remedy its defect in proteid by adding eggs or cheese. This practical necessity has been discovered by the cook long ago, as we see when we look at the rice dishes of the South.

BARLEY AND MAIZE AND CORNSTARCH, AND THEIR VALUE AS FOODS

Barley is another grass which produces food. It is much inferior to wheat, but it is said that loaves made half and half of wheat and barley meal are pleasant and good. We grow much barley in this country, not as a source of food at all, but as a source of alcohol, and we grow it where we might grow wheat.

Maize, or Indian corn, is much used in this country, and can scarcely be overpraised. It is very cheap, very nourishing, and very well absorbed. A great service was done to Ireland when maize was introduced into that country during the potato famine about 1845. Our chief authority says that, "in view of these facts, and of the approaching scarcity of wheat, one cannot help a feeling of regret that maize is not more widely adopted as food amongst the working classes of all countries." Cornstarch is a food stupidly made from maize in such a way as to get practically nothing but the starch. It is, therefore, on the same level as arrowroot, which is also just starch, and is an inferior order of food altogether.

WHY OATMEAL PORRIDGE IS VERY GOOD FOR BOYS AND GIRLS

Oats are the last cereal that we need mention, but they demand special notice. We find that, when a grass grows in a cold country, it prepares for its offspring a high proportion of heat-producing material; whereas, if a grass grows in the tropics, it will be poor in such material. Thus oats, which grow in the North, contain a lot of fat; while rice is specially poor in fat, and therefore the less suitable for a northern civilization. The fat in oats is valuable, of course, and we have already seen that this cereal is very rich in proteid. The strength and size of the Scotsman at his best, his vigor of brain and body, and his capacity to withstand his climate, probably depend in no small degree upon the excellence of oatmeal as a food and its richness in the very substances most needed in such a climate.

Much less attention than is needed has yet been paid to the preparation of oatmeal. Only people whose digestion is strong can deal with large quantities of the ordinary oatmeal, which contains a great deal of husk besides its fat. Some of the new "rolled oats" are much more easy to digest, but, on the other hand, they are prepared in a way which reduces, though not by very much, the amount of nourishment in them. The manufacturers have yet to learn how to get rid of the husk without losing anything else. Oatmeal is very well absorbed by those who can take it. The child who has oatmeal and milk for breakfast, and who can enjoy it, is fortunate.

HOW THE PEOPLE'S FOOD IS CHANGING IN SCOTLAND, AND THE PITY OF IT

Nothing can surpass this combination for children, and therefore the world owes more to it than we recognize. So important is this question that we ought to spare no trouble in cooking the oatmeal so that it can be taken even by children. We must devote as much labor to it as we devote to the preparation of our cup of coffee after dinner. We must find the right kind of oatmeal; we must cook it in the right way, and we must add to it what it needs to make it nice. Some people like to add sugar to oatmeal and milk, and we know that sugar is an excellent food; or you may add salt or jam or syrup. But somehow or other we should arrange our oatmeal so that we can take it regularly every day.

Two great changes have been going on for some years past in the large cities of Scotland, and especially in Edinburgh, Glasgow, and Dundee. In the first place, very careful inquiry has shown that the diet of the people is changing. This especially applies to the poorer classes, and is most serious, as it affects the children. They used to get oatmeal and milk—or, at any rate, oatmeal—

before they went to school. More and more, nowadays, they are getting bread and jam—a "jam-piece," as they call it. The bread is not the best bread, but very starchy, and the jam is little more than sugar and chemical preservatives. Compared with oatmeal and milk, such a diet is rubbish.

THE DESTRUCTION OF THE HIGH QUALITY OF LIFE IN THE SCOTTISH CITIES

It is clear, then, that either all science of food is nonsense, and it does not matter at all what we eat, or else this rapid, general, and extreme change in the food habits of the people must have very large consequences indeed.

Now, these same cities show us at the same time a change going on which can only be called terrible. It is doubtful whether anything so marked and quick has ever been observed anywhere else. This is a very rapid and intense damaging of the people. Properly grown on oatmeal, and under good conditions, the Scotsman is, on the average, the tallest and heaviest man in the world; the younger generations in the big Scottish cities, largely fed on starchy bread and jam, are promising to become, very soon, about the smallest race on the face of the earth. They are already dwarfed by inches. Few things more terrible anywhere are going on than this destruction of the quality of life in Edinburgh, Glasgow, and Dundee, in a land which has for so long led the world in many matters, and, best of all, in the right feeding, education, and upbringing of children, with consequences which are written upon the face of the earth from Pole to Pole and from China to Peru.

THE SORT OF BREAKFAST A CHILD OUGHT NOT TO GO TO SCHOOL UPON

In our study of food, and especially of the cereals, we must beware of forgetting the importance of other things. We must not suppose that the destruction of the city populations in Scotland —where nineteen children out of every twenty require a dentist and do not get him, and suffer for life in consequence— is entirely due to the change in their food. It is also due in Dundee, for instance, to matters of feeding in the first year, because the mothers are going out to look after machinery in factories, and the future life of Scotland is left to chance at home. But the contrast between oatmeal and milk and bread and jam is one we must remember. Bread and jam is all very well in its way, but it is not a complete breakfast for a child to trudge to school and do his lessons upon. We know that the same conditions exist in the United States.

There are so many other foods to consider, like eggs and meat and fruit, and so many other things, like tea and coffee, which are not really foods, that we have not space to say much more about grass. But we must think of this great thing rightly. When we cut a piece of bread and put it into our mouth, we want to see what we are doing from the point of view of the life of the earth.

HOW THE WHOLE STRENGTH OF OUR FOOD COMES FROM THE SUN

We know that the whole animal world depends upon the green vegetable world, which depends upon the sun. Bread does not happen to be green. It was made *in* the green leaves of grass, but is not actually made *of* them, but of the grain they make. Thus, when we take a piece of bread, we are apt to forget that we are really eating grass, which, in its turn, is transformed sunlight, air, and soil. We are putting these things, the energy of sunlight, the carbon from the air, and the other things from the soil, into our mouths; and the whole animal world, from the little amœba of the ponds up to human poets and kings and mothers and children, lives to-day and has always lived upon grass. This is true even if we prefer a diet of nothing but raw meat and hot water, for the meat was made from grass, or even if the meat be a tiger chop, the meat upon which the tiger was fed was itself transformed grass.

In the last resort the whole animal world is therefore vegetarian, and the act of chewing a crust, or swallowing a crumb of bread, is typical, every time it is performed, of the relations that exist between animals and vegetables and the sun that gives them life.

Later on, in the Story of the Earth, we shall learn to look upon the surface of the earth as the place where green leaves make the lives of animals and men possible. The study of our neighbor, the planet Mars, will teach us how precious the green life is; and we shall understand the wisdom of planting trees again in North America.

THE NEXT PART OF THIS IS ON PAGE 3097.

ALICE FALLING DOWN THE RABBIT-HOLE



A white rabbit with pink eyes hurried past Alice, remarking, as he drew his watch from his waistcoat pocket, "Oh dear! Oh dear! I shall be too late!" This aroused the curiosity of the little girl. It was odd to see a rabbit with a waistcoat and a watch! So she ran after him, and, without thinking, pursued him into the rabbit-hole. But he kept ahead, and presently she found herself falling down a great well, which seemed to go right down to the middle of the earth, and had queer cupboards and furniture all the way down. What happened when she and the rabbit got to the bottom we shall learn in good time.

LEWIS CARROLL'S FAMOUS STORY

As we have already read all about Lewis Carroll on page 1482, we need say nothing about the author of "Alice's Adventures in Wonderland." We are going to read the story itself. It is not possible to print here every word of it, to tell all the adventures at full length; but we have taken the story as a whole, and where parts of the original have had to be left out, these have been re-told very briefly, so that the reader can follow the adventures of Alice from beginning to end. Excepting such passages, the story is told in the words of its author. It has been specially illustrated for us by the famous artist Mr. Harry Furniss, who was a friend of Lewis Carroll, and drew the pictures for two of his other fairy tales. As Mr. Furniss knew the author's ideas of how his stories should be illustrated, these charming pictures, drawn according to these ideas, rank high among the many illustrations of "Alice's Adventures."

ALICE IN WONDERLAND

CONTINUED FROM 2946

ALICE was beginning to grow very tired of sitting by her sister on the bank, and of having nothing to do; once or twice she had peeped into the book her sister was reading, but it had no pictures or conversations in it, "and what is the use of a book," thought Alice, "without pictures or conversations?"

So she was considering in her own mind (as well as she could, for the hot day made her feel very sleepy and stupid) whether the pleasure of making a daisy-chain would be worth the trouble of getting up and picking the daisies, when suddenly a white rabbit with pink eyes ran close by her.

There was nothing so *very* remarkable in that; nor did Alice think it so very much out of the way to hear the Rabbit say to himself: "Oh dear! Oh dear! I shall be too late!" (when she thought it over afterwards, it occurred to her that she ought to have wondered at this, but at the time it all seemed quite natural); but when the Rabbit actually *took a watch out of his waistcoat pocket*, and looked at it, and then hurried on, Alice started to her feet, for it flashed across her mind that she had never before seen a rabbit with either a waistcoat pocket or a watch to take out of it, and overcome with curiosity, she ran across the field after him, and was just in time to see him pop down a large rabbit-hole under the hedge.



"Oh dear! Oh dear! I shall be too late!" said the White Rabbit.

In another moment down went Alice after him, never once considering how in the world she was to get out again.

The rabbit-hole went straight on like a tunnel for some way, and then dipped suddenly down, so suddenly that Alice had not a moment to think about stopping herself before she found herself falling down what seemed to be a very deep well.

Either the well was very deep, or she fell very slowly, for she had plenty of time as she went down to look about her, and to wonder what was going to happen next. First, she tried to look down and make out what she was coming to, but it was too dark to see anything; then she looked at the sides of the well, and noticed that they

were filled with cupboards and book-shelves. Here and there she saw maps and pictures hung upon pegs. She took down a jar from one of the shelves as she passed; it was labeled ORANGE MARMALADE, but, to her great disappointment, it was empty. She did not like to drop the jar for fear of killing somebody underneath, so managed to put it into one of the cupboards as she fell past it.

"Well," thought Alice to herself, "after such a fall as this, I shall think nothing of tumbling downstairs. How brave they'll all think me at home! Why, I wouldn't say anything about it, even if I fell off the top of the house." (Which was very likely true.)

Down, down, down. Would the fall *never* come to an end? "I wonder how many miles I've fallen by this time?" she said aloud. "I must be getting somewhere near the centre of the earth. Let me see: that would be four thousand miles down, I think——" (for, you see, Alice had learnt several things of this sort in her lessons in the schoolroom, and though this was not a *very* good opportunity for showing off her knowledge, and there was no one to listen to her, still it was good practice to say it over). 'Yes, that's about the right distance—but then I wonder what latitude and longitude I've got to?" (Alice had not the slightest idea what latitude was, or longitude either, but she thought they were nice grand words to say.)



"What a curious feeling!" said Alice. "I must be shutting up like a telescope."

Presently she began again speaking to herself. "I wonder if I shall fall right *through* the earth? How funny it'll seem to come out among the people that walk with their heads downwards! The Antipathies, I think" (she was rather glad there was no one listening this time, as it didn't sound at all the right word); "but I shall have to ask them what the name of the country is, you know. Please, ma'am, is this New Zealand or Australia?" And she tried to curtsey as she spoke. Fancy *curtseying* as you're falling through the air! Do you think you could manage it? "And what an ignorant little girl she'll think me for asking! No, it will never do to ask; perhaps I shall see it written up somewhere."

Down, down, down. There was nothing else to do, so Alice began talking again. "Dinah'll miss me very much to-night, I should think." (Dinah was the cat.) "I hope they'll remember her saucer of milk at tea-time. Dinah, my dear, I wish you were down here with me. There are no mice in the air, I'm afraid, but you might catch a bat, and that's very like a mouse, you know. But do cats eat bats, I wonder?" And here Alice began to get rather sleepy, and went on saying to herself, in a dreamy sort of way: "Do cats eat bats? Do cats eat bats?" and sometimes, "Do bats eat cats?" for, you know, as she couldn't answer either question, it didn't much matter which way she put it. She felt that she was dozing off, and had just begun to dream that she was walking hand in hand with Dinah, and was saying to her very earnestly: "Now, Dinah, tell me the truth, did you ever eat a bat?" when suddenly, thump! thump! down she came upon a heap of sticks and dry leaves, and the fall was over.

Alice was not a bit hurt, and she jumped up on to her feet in a moment. She looked up, but it was all dark overhead; before her was another long passage, and the White Rabbit was still in sight, hurrying down to it. There was not a moment to be lost. Away went Alice like the wind, and was just in time to hear him say, as he turned a corner: "Oh, my ears and whiskers, how late it's getting!" She was close behind him when she turned the corner, but the Rabbit was no longer to be seen. She found herself in a long, low hall, which

was lit up by a row of lamps hanging from the roof.

There were doors all round the hall, but they were all locked, and when Alice had been all the way down one side and up the other, trying every door, she walked sadly down the middle, wondering how she was ever to get out again.

Suddenly she came upon a little three-legged table, all made of solid glass. There was nothing on it but a tiny golden key, and Alice's first idea was that this might belong to one of the doors of the hall; but, alas! either the locks were too large, or the key was too small, for, at any rate, it would not open any of them. However, on the second time round she came upon a low curtain she had not noticed before, and behind it was a little door about fifteen inches high. She tried the little golden key in the lock, and, to her great delight, it fitted.

Alice opened the door, and found that it led into a small passage, not much larger than a rat-hole. She knelt down and looked along the passage into the loveliest garden you ever saw. How she longed to get out of that dark hall, and wander about among those beds of bright flowers and those cool fountains, but she could not even get her head through the doorway; "and even if my head would go through," thought poor Alice, "it would be of very little use without my shoulders. Oh, how I wish I could shut up like a telescope! I think I could, if I only knew how to begin." For, you see, so many out-of-the-way things had happened lately that Alice had begun to think that very few things indeed were really impossible.

There seemed to be no use in waiting by the little door, so she went back to the table, half hoping she might find another key on it, or, at any rate, a book of rules for shutting people up like telescopes. This time she found a little bottle on it ("which certainly was not here before," said Alice), and tied round the neck of the bottle was a paper label, with the words DRINK ME beautifully printed on it in large letters.



"Curiouser and curiouser!" cried Alice. "Now I'm opening out like the largest telescope that ever was. Good-bye, feet! Oh, my poor little feet!"

It was all very well to say "Drink me," but the wise little Alice was not going to do *that* in a hurry. "No, I'll look first," she said, "and see whether it's marked '*poison*' or not"; for she had read several nice little stories about children who had got burnt, and eaten up by wild beasts and other unpleasant things, all because they *would* not remember the simple rules their friends had taught them; such as, that a red-hot poker will burn you if you hold it too long; and that, if you cut your finger *very* deeply with a knife, it usually bleeds; and she had never forgotten that, if you drink much from a bottle marked "poison," it is almost certain to disagree with you sooner or later.

However, this bottle was *not* marked "poison," so Alice ventured to taste it, and, finding it very nice (it had, in fact, a sort of mixed flavor of cherry-tart, custard, pineapple, roast turkey, toffy, and hot buttered toast), she very soon finished it off.

"What a curious feeling!" said Alice. "I must be shutting up like a telescope."

And so it was, indeed; she was now only ten inches high, and her face brightened up at the thought that she was now the right size for going through the little door into that lovely garden. . . . But, alas for poor Alice, when she got to the door she found she had forgotten the little golden key, and when she went back to the table for it she found she could not possibly reach it.

She could see it quite plainly through the glass, and she tried her best to climb up one of the legs of the table, but it was too slippery; and when she had tired herself out with trying, the poor little thing sat down and cried. . . .

Soon her eye fell on a little glass box that was lying under the table. She opened it, and found in it a very small cake, on which the words EAT ME were beautifully marked in currants.

"Well, I'll eat it," said Alice, "and if it makes me grow larger, I can reach the key; and if it makes me grow smaller, I can creep under the door; so either way I'll get into the garden, and I don't care which happens."

She ate a little bit, and said anxiously to herself: "Which way? Which way?" holding her hand on the top of her head to feel which way it was growing, and she was quite surprized to find that she remained the same size; to be sure, this is what generally happens when one eats cake, but Alice had got so much into the way of expecting nothing but out-of-the-way things to happen that it seemed quite dull and stupid for life to go on in the common way.

So she set to work, and very soon finished off the cake.

"Curiouser and curiouser!" cried Alice (she was so much surprized that for the moment she quite forgot how to speak good English). "Now I'm opening out like the largest telescope that ever was. Good-bye, feet!" (for when she looked down at her feet they seemed to be almost out of sight, they were getting so far off). "Oh, my poor little feet! I wonder who will put on your shoes and stockings for you now, dears? I'm sure *I* shan't be able. I shall be a great deal too far off to trouble myself about you; you must manage the best way you can. But I must be kind to them," thought Alice, "or perhaps they won't walk the way I want to go. Let me see; I'll give them a new pair of boots every Christmas." . . .

Just at this moment her head struck against the roof of the hall; in fact, she was now more than nine feet high, and she at once took up the little golden key and hurried off to the garden door.

Poor Alice! It was as much as she could do, lying down on one side, to look through into the garden with one eye; but to get through was more hopeless than ever. She sat down and began to cry again.

"You ought to be ashamed of yourself," said Alice, "a great girl like you" (she might well say this), "to go on crying in this way! Stop this moment, I tell you!"

But she went on all the same, shedding gallons of tears, until there was a large pool all round her, about four inches deep and reaching half down the hall.

After a time she heard a little pattering of feet in the distance, and she hastily dried her eyes to see what was coming. It was the White Rabbit returning, splendidly dressed, with a pair of white kid gloves in one hand and a large fan in the other. He came trotting along in a great hurry, muttering to himself as he came: "Oh, the Duchess! the Duchess! Oh, won't she be savage if I've kept her waiting!"

Alice felt so desperate that she was ready to ask help of anyone; so, when the Rabbit came near her, she began, in a low, timid voice:

"If you please, sir——"

The Rabbit started violently, dropped the white kid gloves and the fan, and skurried away into the darkness as hard as he could go.

Alice took up the fan and gloves, and, as the hall was very hot, she kept fanning herself all the time she went on talking:

"Dear, dear! How queer everything is to-day! And yesterday things went on just as usual. I wonder if I've been changed in the night? Let me think: was I the same when I got up this morning? I almost think I can remember feeling a little different. But if I'm not the same, the next question is: Who in the world am I? Ah, *that's* the great puzzle!"

And she began thinking over all the children she knew, that were of the same age as herself, to see if she could have been changed for any of them.

"I'm sure I'm not Ada," she said, "for her hair goes in such long ringlets, and mine doesn't go in ringlets at all; and I'm sure I can't be Mabel, for I know all sorts of things, and she, oh, she knows such a very little! Besides, *she's* she, and *I'm* I, and—oh dear, how puzzling it all is! I'll try if I know all the things I used to know. Let me see: four times five is twelve, and four times six is thirteen, and four times seven

is—oh dear, I shall never get to twenty at that rate! However, the multiplication table don't signify; let's try geography. London is the capital of Paris, and Paris is the capital of Rome, and Rome—no, *that's* all wrong, I'm certain. I must have been changed for Mabel. I'll try and say 'How doth the little——.'" And she crossed her hands on her lap as if she were saying lessons, and began to repeat it, but her voice sounded hoarse and strange, and the words did not come the same as they used to do:

"How doth the little crocodile
Improve his shining tail,
And pour the waters of the Nile
On every golden scale!

"How cheerfully he seems to grin,
How neatly spreads his claws,
And welcomes little fishes in
With gently smiling jaws!"

Alice was quite certain these were not the right words, and she rather fancied now that she must be Mabel, after all. But presently, on looking down at her hands, she was surprized to see that she had put on one of the Rabbit's little white kid gloves while she was talking.

"How *can* I have done that?" she thought. "I must be growing small again."

She got up, and went to the table to measure herself by it, and found that, as nearly as she could guess, she was now about two feet high, and was going on shrinking rapidly. She soon found out that the cause of this was the fan she was holding, and she dropped it hastily, just in time to save herself from shrinking away altogether.

"That *was* a narrow escape," said Alice, a good deal frightened at the sudden change, but very glad to find herself still in existence; "and now for the garden." And she ran with all speed back to the little door; but, alas! the little door was shut again, and the little golden key was lying on the glass table as before, "and things are worse than ever," thought the poor child, "for I never was so small as this before, never! And I declare it's too bad, that it is!"

As she said these words her foot slipped, and in another moment, splash! she was up to her chin in salt water. Her first idea was that she had somehow fallen into the sea, "and in that case I can go back by railway," she said to herself. . . . However, she soon made out that she was in the pool of tears which she had wept when she was nine feet high.

"I wish I hadn't cried so much," said Alice, as she swam about, trying to find her way out. "I shall be punished for it now, I suppose, by being drowned in my own tears. That *will* be a queer thing, to be sure. However, everything is queer to-day."



It was the White Rabbit, splendidly dressed. He trotted along, muttering to himself: "Oh, the Duchess! the Duchess! Oh, won't she be savage if I've kept her waiting!"

Just then she heard something splashing about in the pool a little way off, and she swam nearer to make out what it was. At first she thought it must be a walrus or hippopotamus, but then she remembered how small she was now, and she soon made out that it was only a mouse that had slipped in like herself.

"Would it be of any use, now," thought Alice, "to speak to this mouse? Everything is so out-of-the-way down here that I should think very likely it can talk; at any rate, there's no harm in trying." So she began: "O Mouse, do you know the way out of this pool? I am very tired

of swimming about here, O Mouse." (Alice thought this must be the right way of speaking to a mouse; she had never done such a thing before, but she remembered having seen in her brother's Latin Grammar, "A mouse—of a mouse—to a mouse—a mouse—O mouse.") The Mouse looked at her rather inquisitively, and seemed to her to wink with one of its little eyes, but it said nothing.

"Perhaps it doesn't understand English," thought Alice; "I dare say it's a French mouse, come over with William the Conqueror." So she began again: "Où est ma chatte?" which was the first sentence in her French lesson book. The Mouse gave a sudden leap out of the water, and seemed to quiver all over with fright. "Oh, I beg your pardon!" cried Alice hastily, afraid that she had hurt the poor animal's feelings. "I quite forgot you don't like cats."

"Not like cats!" cried the Mouse, in a shrill, passionate voice. "Would *you* like cats if you were me?"

"Well, perhaps not," said Alice, in a soothing tone; "don't be angry about it. And yet I wish I could show you our cat Dinah; I think you'd take a fancy to cats if you could only see her. She is such a dear quiet thing," Alice went on, half to herself, as she swam lazily about in the pool, "and she sits purring so nicely by the fire, licking her paws and washing her face; and she is such a nice soft thing to nurse, and she's such a capital one for catching mice——. Oh, I beg your pardon!" cried Alice again, for this time the Mouse was bristling all over, and she felt certain it must be really offended. "We won't talk about her any more if you'd rather not."

"We, indeed!" cried the Mouse, who was trembling down to the end of its tail. "As if *I* would talk on such a subject! Our family always hated cats—nasty, low, vulgar things! Don't let me hear the name again!"

"I won't, indeed!" said Alice, in a great hurry to change the subject of conversation.

"Are you—are you fond—of—of dogs?" The Mouse did not answer, so Alice went on eagerly: "There is such a nice little dog near our house I should like to show you. A little bright-eyed terrier, you know, with oh, such long curly brown hair! And it'll fetch things when you throw them, and it'll sit up and beg for its dinner, and all sorts of things—I can't remember half of them—and it belongs to a farmer, you know, and he says it's so useful, it's worth a hundred pounds! He says it kills all the rats and——. Oh dear!" cried Alice, in a sorrowful tone. "I'm afraid I've offended it again." For the Mouse was swimming away from her as hard as it could go, and making quite a commotion in the pool as it went.

So she called softly after it:

"Mouse, dear! Do come back again, and we won't talk about cats or dogs either, if you don't like them!" When the Mouse heard this, it turned round and swam slowly back to her; its face was quite pale (with passion, Alice thought), and it said in a low, trembling voice: "Let us get to the shore, and then I'll tell you my history, and you'll understand why it is I hate cats and dogs."

It was high time to go, for the pool was getting quite crowded with the birds and animals that had fallen into it; there were a duck and a dodo, a lory and an eaglet, and several other curious creatures. Alice led the way, and the whole party swam to the shore.

A very queer-looking party of dripping birds and animals now gathered on the bank of the Pool of Tears; but they were not so queer as their talk. First the Mouse, who was quite a person of authority among them, tried to dry them by telling them frightfully dry stories from history. But Alice said she was as wet as ever after she had listened to the bits of English history; so the Dodo proposed a Caucus race. They all started off when they liked, and stopped when they liked. The Dodo said everybody had won, and Alice had to give the prizes. Luckily she had some sweets, which were not wet, and there was just one for each of them, but none for herself. The party were anxious she, too, should have a prize, and as she happened to have a thimble, the Dodo commanded her to hand it to him, and then, with great ceremony, the Dodo presented it to her, saying: "We beg your acceptance of this elegant thimble," and they all cheered. Of course, Alice thought this all very absurd; but they were dry now, and began eating their

sweets. Then the Mouse began to tell Alice its history, and to explain why it hated C and D—for it was afraid to say cats and dogs. But she soon offended the mouse, first by mistaking its "long and sad tale" for a "long tail," and next by thinking it meant "knot" when it said "not," so that it went off in a huff. Then when she mentioned Dinah to the others, and told them that was the name of her cat, the birds got uneasy, and one by one the whole party gradually went off and left her all alone. Just when she was beginning to cry, she heard a pattering of little feet, and half thought it might be the Mouse coming back to finish its story.

It was the White Rabbit, trotting slowly back again, and looking anxiously about as he went, as if he had lost something; and she heard him muttering to himself: "The Duchess! The Duchess! Oh, my dear paws! Oh, my fur and whiskers! She'll get me executed, as sure as ferrets are ferrets! Where *can* I have dropped them, I wonder?" Alice guessed in a moment that he was looking for the fan and the pair of white kid gloves, and she very good-naturedly began hunting about for them, but they were nowhere to be seen—everything seemed to have changed since her swim in the pool, and the great hall, with the glass table and the little door, had vanished completely.

Very soon the Rabbit noticed Alice, as she went hunting about, and called out to her in an angry tone: "Why, Mary Ann, what *are* you doing out here? Run home this moment, and fetch me a pair of gloves and a fan. Quick, now!" And Alice was so much frightened that she ran off at once in the direction he pointed to, without trying to explain the mistake that he had made.

"He took me for his housemaid," she said to herself as she ran. "How surprized he'll be when he finds out who I am! But I'd better take him his fan and gloves—that is, if I can find them." As she said this, she came upon a neat little house, on the door of which was a bright brass plate with the name W. RABBIT engraved upon it. She went in without knocking, and hurried upstairs, in great fear lest she should meet the real Mary Ann, and be turned out of the house before she had been able to find the fan and gloves.



"Would it be of any use, now," thought Alice, "to speak to this mouse? Everything is so out-of-the-way down here that I should think very likely it can talk; at any rate, there's no harm in trying." So she began: "O Mouse, do you know the way out of this pool? I am very tired of swimming about, O Mouse."

"How queer it seems," Alice said to herself, "to be going messages for a rabbit! I suppose Dinah'll be sending me on messages next." . . .

By this time she had found her way into a tidy little room with a table in the window, and on it—as she had hoped—a fan and two or three pairs of tiny white kid gloves. She took up the fan and a pair of the gloves, and was just going to leave the room, when her eye fell upon a little bottle that stood near the looking-glass. There was no label this time with the words DRINK ME, but, nevertheless, she uncorked it and put it to her lips.

"I know *something* interesting is sure to happen," she said to herself, "whenever I eat or drink anything; so I'll just see what this bottle does. I do hope it'll make me grow large again, for

really I'm quite tired of being such a tiny little thing."

It did so, indeed, and much sooner than she had expected; before she had drunk half the bottle, she found her head pressing against the ceiling, and had to stoop to save her neck from being broken. . . . She went on growing and growing, and very soon had to kneel down on the floor; in another minute there was not even room for this, and she tried the effect of lying down with one elbow against the door, and the other arm curled round her head.

Still she went on growing, and, as a last resource, she put one arm out of the window, and one foot up the chimney, and said to herself:

"Now I can do no more, whatever happens. What *will* become of me?"

Luckily for Alice, the little magic bottle had now had its full effect, and she grew no larger; still, it was very uncomfortable, and, as there seemed to be no sort of chance of her ever getting out of the room again, no wonder she felt unhappy.

"It was much pleasanter at home," thought poor Alice, "when one wasn't always growing larger and smaller, and being ordered about by mice and rabbits. I almost wish I hadn't gone down that rabbit-hole; and yet—and yet—it's rather curious, you know, this sort of life. I do wonder what *can* have happened to me! When I used to read fairy tales, I fancied that kind of thing never happened, and now here I am in the middle of one." . . .

After a few minutes she heard a voice outside, and stopped to listen.

"Mary Ann! Mary Ann!" said the voice. "Fetch me my gloves this moment!" Then came a little pattering of feet on the stairs. Alice knew it was the Rabbit coming to look for her, and she trembled till she shook the house, quite forgetting that she was now about a thousand times as large as the Rabbit, and had no reason to be afraid of him.

Presently the Rabbit came up to the door, and tried to open it; but, as the door opened inwards, and Alice's elbow was pressed hard against it, that attempt proved a failure. Alice heard him say to himself: "Then I'll go round and get in at the window."

"*That* you won't," thought Alice, and, after waiting till she fancied she heard the Rabbit just under the window, she suddenly spread out her hand, and made a snatch in the air. She did not get hold of anything, but she heard a little shriek and a fall, and a crash of broken glass, from which she concluded that it was just possible he had fallen into a cucumber-frame, or something of the sort.

Next came an angry voice, the Rabbit's:

"Pat! Pat! Where are you?" And then a voice she had never heard before: "Sure then, I'm here. Digging for apples, yer honor."

"Digging for apples, indeed!" said the Rabbit angrily. "Here! Come and help me out of *this*!" (Sounds of more broken glass.)

"Now tell me, Pat, what's that in the window?"

"Sure, it's an arm, yer honor." (He pronounced it "arrum.")

"An arm, you goose! Who ever saw one that size? Why, it fills the whole window!"

"Sure, it does, yer honor; but it's an arm for all that."

"Well, it's got no business there, at any rate; go and take it away."

There was a long silence after this, and Alice could only hear whispers now and then, such as: "Sure, I don't like it, yer honor, at all—at all." "Do as I tell you, you coward!"

And at last she spread out her hand again, and made another snatch in the air.

This time there were *two* little shrieks, and more sounds of broken glass.

"What a number of cucumber-frames there must be!" thought Alice. "I wonder what they'll do next? As for pulling me out of the window, I only wish they *could*. I'm sure I don't want to stay in here any longer."

She waited for some time without hearing anything more. At last came a rumbling of little cart-wheels, and the sound of a good many voices all talking together; she made out the words: "Where's the other ladder? Why, I hadn't to bring but one; Bill's got the other. Bill, fetch it here, lad. Here, put 'em up at this corner. No, tie 'em together first, they don't reach half high enough yet. Oh, they'll do well enough; don't be particular! Here, Bill, catch

ALICE AT THE STORY-TELLING PARTY



It was a queer-looking party of dripping birds and animals that gathered around Alice on the edge of the Pool of Tears. The Mouse tried to dry them by telling very dry stories from history, and Alice broke the party up at last by thoughtlessly speaking of her cat Dinah. The animals simply couldn't bear to hear of Dinah or any other cat. One by one the whole party gradually went off and left her all alone.

hold of this rope! Will the roof bear? Mind that loose slate! Oh, it's coming down! Heads, below!" (a loud crash). "Now, who did that? It was Bill, I fancy. Who's to go down the chimney? Nay, *I* shan't. *You* do it? *That* I won't, then! Bill's got to go down. Here, Bill, the master says you've got to go down the chimney!"

"Oh! So Bill's got to come down the chimney, has he?" said Alice to herself. "Why, they seem to put everything upon Bill. I wouldn't be in Bill's place for a good deal; this fireplace is narrow, to be sure; but I *think* I can kick a little."

She drew her foot as far down the chimney as she could, and waited till she heard a little animal (she couldn't guess of what sort it was) scratching and scrambling about in the chimney close above her; then, saying to herself, "This is Bill," she gave one sharp kick, and waited to see what would happen next.

The first thing she heard was a general chorus of "There goes Bill!" then the Rabbit's voice alone: "Catch him, you by the hedge!" Then silence, and then another confusion of voices: "Hold up his head. Brandy now. Don't choke him. How was it, old fellow? What happened to you? Tell us all about it."

Last came a little feeble squeaking voice. ("That's Bill," thought Alice.) "Well, I hardly know. No more, thank'ye; I'm better now, but I'm a deal too flustered to tell you. All I know is, something comes at me like a Jack-in-the-box, and up I goes like a sky-rocket."

"So you did, old fellow," said the voices of the others, speaking in chorus.

"We must burn the house down," said the Rabbit's voice.

And Alice called out as loud as she could: "If you do, I'll set Dinah at you."

There was dead silence instantly, and Alice thought to herself: "I wonder what they *will* do next? If they had any sense, they'd take the roof off." After a minute or two, they began moving about again, and Alice heard the Rabbit say: "A barrowful will do to begin with."

"A barrowful of *what?*" thought Alice. But she had not long to doubt, for the next moment a shower of little pebbles came rattling in at the window, and some of them hit her in the face. "I'll put a stop to this," she said to herself, and shouted out: "You'd better not do that again!" which produced another dead silence.

Alice noticed, with some surprize, that the pebbles were all turning into little cakes as they lay on the floor, and a bright idea came into her head.



ALICE IN THE RABBIT'S HOUSE

"If I eat one of these cakes," she thought, "it's sure to make some change in my size; and, as it can't possibly make me larger, it must make me smaller, I suppose."

So she at once swallowed one of the cakes, and to her great delight she found that she immediately began to shrink. As soon as she had shrunk small enough to get through the door, she ran quickly out of the house, and found quite a crowd of little animals and birds waiting outside. The poor little Lizard, Bill, was in the middle of the crowd, being held up by two guinea-pigs, who were giving him something out of a bottle. They all made a rush at Alice the moment she appeared; but she ran off as hard as she could, and soon found herself safe in a thick wood. The story of what happened there and what the Blue Caterpillar said to her is told on page 3089.

THE FABLES OF ÆSOP THE SLAVE

MERCURY AND THE WOODMAN

IN the olden days, when people believed in a great many different gods, a man was cutting down a tree beside a river, when by accident the axe slipped out of his hand, fell into the water, and at once sank to the bottom. As the man was very poor, and could not afford to buy another axe, he sat down and grieved bitterly over his loss.

Suddenly the god Mercury appeared to him and asked him what was the matter. When the poor man told him, he at once dived to the bottom of the river, and when he came up again, held out a golden axe and asked the man if that was the one he had lost. The honest woodman said it was not. Then Mercury dived a second time, and brought up a silver axe. This, too, the woodman refused, saying that it did not belong to him.

The third time Mercury dived he brought up the iron axe that the woodman had lost. Its owner was delighted to see it, and thanked Mercury very warmly for restoring it to him. The god was so pleased with the man's honesty in refusing the gold and silver axes that he gave both of them to him as a reward.

When the woodman told the story to his companions, one of them went off to the river's bank, and purposely dropped his axe into the water. Then he sat down on the bank and pretended to cry and lament over his loss.

The god Mercury came as before, and, diving into the river, brought up a golden axe, and asked if that was the one the man had lost. He greedily snatched at it, and said that it was, upon which, Mercury threw it back into the river, and would not even restore the axe that the man had dropped.

Honesty is the best policy.

THE WOLF AND THE KID

A MOTHER goat, who was going out in search of food, shut up her young kid at home and warned him not to open the door to anyone till she came back.

A wolf, who was hiding behind a bush close by, heard what she said, and as soon as she had gone he came and knocked at the door, and then, imitating the voice of the goat, called to the kid to open the door. But the kid was looking through the keyhole, and could see that it was not his mother; so he called out to the wolf to go away, saying that, however he might imitate the goat's voice, he looked far too much like a wolf to be trusted.

Never trust people who pretend to be different from what they really are.

THE FARMER AND THE STORK

A FARMER set a net in his fields one day to catch the cranes and geese which came to eat the newly-sown corn. Several of these birds were caught in the net, and amongst them was a stork, who pleaded very hard for his life, telling the farmer that he was not a goose or a crane, but a poor, harmless stork; that he did not come to steal the corn, but merely came in company with the other birds.

"All this may be very true," replied the farmer, "but as I have caught you with the thieves, you must suffer the same punishment."

If we keep company with bad people, we must expect to suffer the consequences.

THE STAG LOOKING INTO THE WATER

A STAG, drinking by the side of a pond, saw himself reflected in the water, as in a looking-glass. He stood admiring himself, and said: "Oh, what a beautiful pair of horns I have! How gracefully they hang over my forehead, and how nice they make my face look! I wish the rest of my body was as handsome; but I have such long, thin legs that I am really quite ashamed of anyone seeing them."

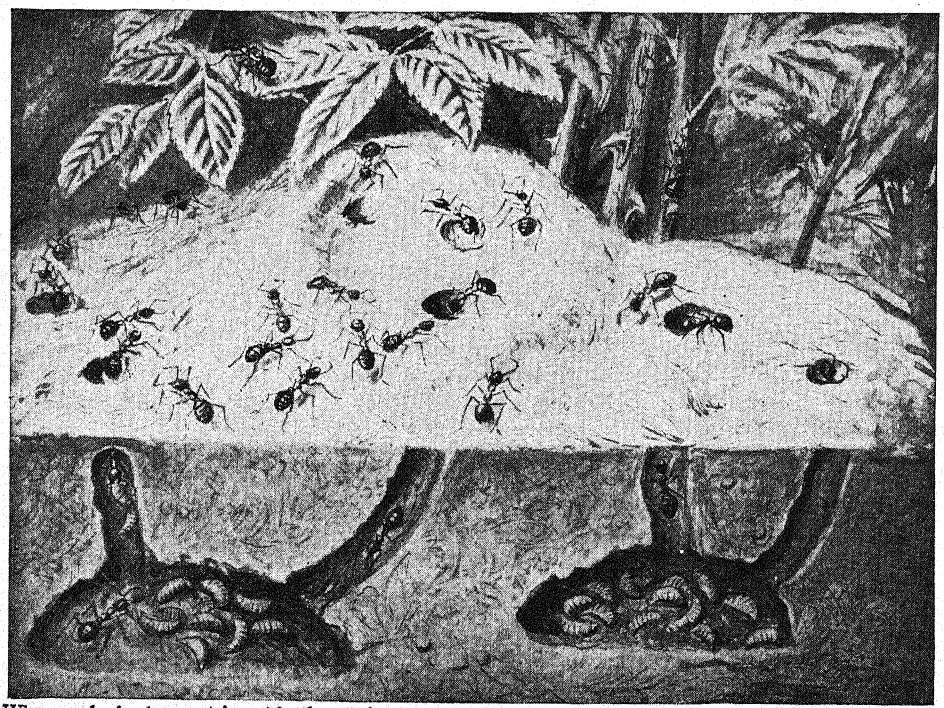
Just then came the noise of some huntsmen and a pack of hounds. Away darted the stag in a fright, and, bounding nimbly along on his slender legs, he soon left the men and dogs at a great distance behind him. Then he rushed into a wood to hide himself, but at the entrance his horns got entangled in some branches, and he was held fast till the hounds came and killed him.

As he was dying, he said: "Oh, how unfortunate I am! I see now that the horns of which I was so proud are the cause of my death, while the long, thin legs that I thought so ugly are the only things that could have saved me."

Often the things we like most are not the best for us; while some things we dislike are useful and valuable.

THE NEXT STORIES ARE ON PAGE 3089.

A WONDERFUL CITY OF ANTS

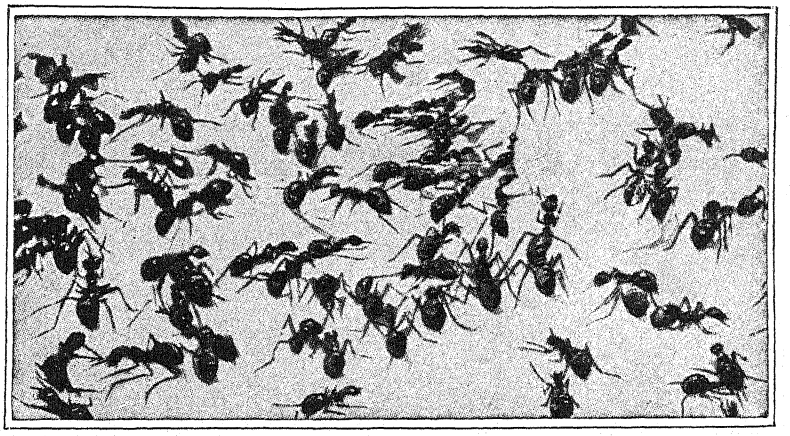


When we look at an ants' nest in the garden we see only the top, and can but wonder what it is like below. This picture shows the galleries leading into the city. At the bottom are the baby ants, attended by workers.



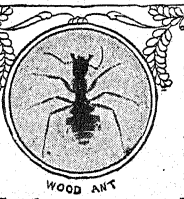
Here the ants are all at home, down in the ground, so we are able to photograph the top of their city, without any of the busy workers getting in the way and blocking up the passages. Each of the holes that we see here is the end of an avenue leading into the city below, and has, of course, been made entirely by the ants.

The photographs on these pages are by the Rev. S. N. Sedgwick, S. Kent, and others.



THE LIFE OF THE ANT WORLD

CONTINUED FROM 2860



WOOD ANT

THERE is a friendly quarrel between admirers of the bees and ants. Men who have devoted years to studying the life of the bee declare that their favorite is without doubt the most wonderful of creatures; while, on the other hand, the men who have for years and years pondered upon the marvels of ant life assert that *their* little friend is the greatest miracle in Nature. Those of us who read this have probably studied the story of the bee that begins on page 2849, and now we have an opportunity of comparing it with the story of the ant, and of deciding for ourselves which shall be our favorite.

As we compare the bees and their relatives, the ants, we may, in starting, give a thought to the differences and the resemblances between the two. They both have a marvelous organization. They live together in great numbers upon a plan which seems almost human in its evidence of care and attention to details. The life of the bee appeals to most of us more than that of the ant, perhaps, because it is so beautiful and romantic. The labors of its day are passed among the flowers in the golden sunshine, and, largely through the visits of the bees which they supply with food, the flowers are made beautiful and fruitful.

We should, no doubt, have many flowers in the world if there were no ants, though we must remember that the ants, while not directly helping the flowers, do help indirectly, by killing insects which would injure the plants and that by digging the ground, they help to make it fruitful. For sheer beauty we may agree that the life-story of the bee is more charming than that of the ant. But when that is said, we have to admit that the life-story of the ant is the most extraordinary in the whole book of Nature. The ant is only a little insect, but when they consider the wonders of his daily life, great men stand in amazement and wonder if this tiny insect does not in some degree possess real intelligence.

There are over two thousand species of ants in the warm and temperate regions of the world—we in North America possess about two hundred—therefore it will be impossible for us to go into the details of many species. We shall have to confine our attention to a few of the best known. Once we have learned something about them we may watch

them everywhere. Any one of them is remarkable enough to deserve long study. In what respect, we may well ask, are they superior in intelligence to the horse, the elephant, and the dog? They are superior because they live together in cities as human beings live; because they construct wonderful dwellings; because they divide their labors among themselves as we do; because they cultivate crops, and store food in barns; because they keep cows and milk them.

How the Ants Love Their Relatives and Dislike Strangers

Intelligence does not always result in good, and the intelligence of the ants leads them into mischief. They have armies which engage in fierce wars, wars fought solely for the purpose of robbery; and they make slaves of ants that are weaker than themselves. Are not these feats wonderful enough to justify the placing of the ants next in order of intelligence to mankind?

The ants are like ourselves in the way that they show their feelings. The stupid among ourselves dislike foreigners. So do ants; they kill a stranger ant. We love our relatives, or at least we should. The ants love their relatives. They have the most wonderful memory. An ant which has been taken from its nest and kept captive for months, upon returning to its nest, is immediately recognized by the others, who caress it and show the greatest joy at its return. But if a strange ant should go into the nest with the returned wanderer, the rest would at once kill the stranger.

There is something more than mere memory, as we know it, in this recognition of ants by ants. Their sense of smell must help them. We know that the sense of smell helps one ant to find another for which it is looking. We know, too, that the sense of smell will enable an ant to find its way back to a place where it has once been.

Baby Ants Born Abroad and Welcomed to Their Home

The sense of smell, we may say, then, must help in the recognition of an ant which has been absent from its family. That makes us think that each community of ants has a scent peculiar to itself, and for this reason: In the wars of the ants, and they are very real wars, in which they kill each other mercilessly, they seem, in the thickest of the fight, to distinguish between ants from their own colony, and ants of the same species from another colony. It is thought that they do this by their sense of smell. Lord Avebury took some pupæ from nests of ants and placed them in another nest to be reared by other ants. When the young ants were placed in the nests from which the pupæ had been taken, they were welcomed, and seemed to be recognized by the other ants. When, however he placed the young ants in strange nests they were pulled about by the occupants of the nests, and were killed and their bodies dragged out and thrown away. They know the ant born from the egg laid in their nest, and welcome it with joy. If a young ant of their own species, reared from an egg laid in another nest, be put in, they at once kill it.

If they are like us in their building, in their wars, in their dislike of foreigners and their love of their own, they are like us again in their play and in their rejoicing. They wrestle and leap and play in their way as we do in ours, and when they are at their games possibly they laugh as heartily as we do, though our ears are not sensitive enough to hear the merriment which our eyes can plainly see.

The Queen Ant Who Pulls Off Her Wings and Stays at Home

Like the bees, to whose family they belong, the ants have their queens, their drones—though we do not call the male ants drones—and their busy workers. They pass through the same stages as the bee. First there is the egg, next the larva, then the chrysalis, and finally the imago, or perfect insect.

The beginning of a colony of ants is like the beginning of a bee-hive. From their eggs are hatched the queens and males which have to go forth into the world. Therefore they have wings. The workers have no wings, and go through life on foot.

On a bright day in summer the young queens and the handsome males come out of the nest and sail away into the sunlight. It is their wedding day. For just this one day the queen has her wings. She might perhaps keep them if she chose, and fly again on other days. But Nature tells her that from this one day her place is in her own home. She never flies again. When she descends to the earth, she sets to work and deliberately

pulls off her wings. For the rest of her life she must walk, like the rest of the ants. When she ceases to fly, her duties in life begin. She has to found a new colony, or to lay eggs for a colony already existing.

With the poor male the case is different. His wedding day is the beginning and ending of his life in the air. His wedding and his death occur on the same day. He may be caught by a bird, or upon the ground some spider may eat him. But, whatever his fate, he never tries to re-enter his old home. If worker ants of his own family see him lying on the ground, they do not help him. They know that he would be useless in the home, so they pass him by; and when the night comes, if he has lived so long, he dies. It seems sad, but it is a law of Nature, and it is no harder for the male ant to die at the close of his wedding day than for a worker ant to die when her course in life is run.

In spite of all we know about the habits of the ant, there is still some doubt as to the way in which an ant colony is formed. Lord Avebury, who was one of the greatest authorities in the world on ants, tried several times to get ants which had no queen to adopt a queen from another nest; but they attacked her, and would not have her.

How the Queen Ant Forms a Colony

This suggests that if a queen is to set up her court with a numerous retinue of servants, she must begin at the end of her wedding day; that she must not attempt to settle down in one nest, and then go off to another. Apparently, what happens is this: When she descends to the earth after her first and last flight, she sees a number of worker ants, and goes off with them as her attendants to start a nest at once, or else they seize her and carry her off to their own nest. There may be two or three queen ants already in it if it is a large colony. They will not attack her as they would attack another queen which had been living since her wedding day in another nest. They can all be quite good friends together, each queen having her separate group of attendants. When worker ants carry a young queen to their nest, they may clip off her wings themselves to prevent her going off and leaving them, and then set a guard over her until she settles down in happiness and comfort to dwell with them.

But this is by no means always the case. Very often, the queen finds herself quite alone. She is not daunted, however, by her solitary state. She bravely sets to work to make a nest for herself. In this she lays her eggs and carefully tends them, and the larvæ which hatch out, until the young ants appear to take up their work of nursing and feeding and building. All this time—perhaps for months—the queen has not only fed the larvæ from the substance of her own body, but has fasted unless when, driven by hunger, she has eaten some of her own eggs, some of which she has also given to the larvæ. Once the worker ants appear, however, they keep her well supplied, and soon build up a colony, equipped in the same way as all their sister colonies are.

Now let us suppose that we are watching a queen-mother in a home of her own, which she has adopted, or which has grown out from the centre which she built. Everywhere she goes, she is surrounded by a bodyguard, who watch over her every move with what seems like loving care. Everywhere she moves they circle round her, and the moment an egg is laid, it is snatched up by one of the guard who runs off to the nursery with it, while another member of the guard drops in to take her place.

The Wonderful Dwellings Made by Ants

We call their dwelling a nest. It is more than a nest to them. It is a city and fortress and storehouse. The mound-building ants raise pyramid-like structures, some of which are three feet high and twelve feet in diameter, and in these they make galleries and halls, floor above floor. The yellow honey ants of the Garden of the Gods cut through the sandstone, and make an elaborate underground city, and above it build a little cone, covered with pebbles. The harvester ants, about which we read on page 2972 cut their underground city out of hard clay, and above it keep a round space clear of grass and weeds. From this circle, which we may call a plaza, they cut straight paths through the surrounding grass, and along these paths carry home their harvest of seeds.

There are as many forms of nests as there are forms of ants. In South America certain ants build those great ant-hills which the tamanoir and other

ant-eaters break open. These are wonderful structures with their halls and galleries, their granaries, nurseries, and so forth.

A MONSTER ANT CITY BIGGER THAN A CITY SQUARE

What we call an ants' nest may include a whole series of ant dwellings of the same species. An explorer discovered one "nest," as we say, which consisted of over 200 colonies, and extended 200 yards in all directions from its centre. As there may be from 5,000 to 500,000 ants in each nest, we may count up for ourselves the probable number of ants in such a settlement.

Before leaving the subject, we must remember something about other famous forms of nests. That of the brown, mound-building ant may consist of thirty or forty stories, one above another.

There are places in the Allegheny Mountains where hundreds of the dwellings of the mound-builders cluster thickly together over spaces of thirty and fifty acres.

ANTS THAT MAKE BRICKS OF CLAY AND BUILD THEIR CITIES LIKE MEN

The brown ants make these great buildings by taking moist earth or clay and scraps of leaves and decayed wood, and molding it with their mouths into little sticky pellets; then building each pellet into place, like our bricklayers setting bricks. They are really brickmakers and builders, with no tools, save their jaws and feelers and legs.

They share their labor with one another. While some of the ants make the pellets ready, others scoop little hollows in the floor, and the ridges that stand up between the hollows form the foundation upon which the walls are built. When the foundations are ready, the pellets are brought and laid on top, and pressed down by the jaws and feet of the bricklaying ants. When the walls and pillars have reached the proper height, pellets are stuck into each angle and on top of the pillars. Then other pellets are stuck to the edges of those already in position. As soon as one lot is dry another lot is added. The pellets are so moist and sticky that they readily become attached to those against which they are pressed, and so in a very short time these little master-builders have built a ceiling two inches across over a chamber or gallery.

Other ants convert the dust of wood, earth, and spiders' webs into a paste, which hardens; and they make their buildings of this. Others make tiles of another substance, while the umbrella ant, or Saüba ant, cuts leaves, and with these thatches its roof, making domes two feet high and forty yards across.

ANT SOLDIERS THAT WEAR HELMETS AND FACE THE FOE BRAVELY

Smoke was blown into an opening in one of these Saüba colonies, and it came out from a number of other holes at least seventy yards apart. These ants are divided into five classes. There are the males and the queens, there are the ordinary workers, and then there are two special sorts of soldier ants—one lot with hard, horny helmets, and the others having big heads, covered with stiff hair. These soldiers do no ordinary work. What, then, can be their purpose?

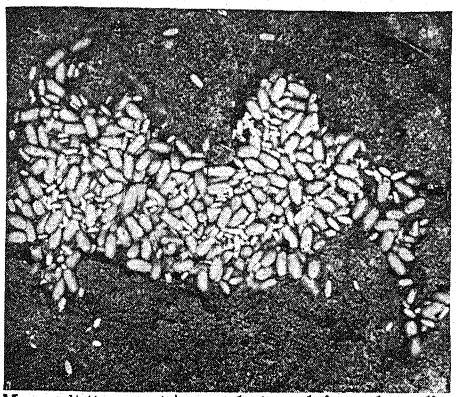
They attend the workers who go out to gather the leaves, and, should they be attacked by other ants, the hard-headed soldiers it is said form a ring round the workers, with their heads towards the foe, and no matter how hard the enemy try, they cannot make any impression upon the thick, armored heads of the soldier Saübas.

But it is the worker Saübas which are the more interesting. They climb the trees, and with their sharp jaws cut the leaves into pieces of about the size of a dime. If the tree is a high one, the workers may let the pieces which they cut drop to the ground to form a heap for the cutters to carry away when they descend. If the colony be a numerous one, other workers will be under the tree in readiness to receive the pieces as they fall, and to carry them off to the dwelling. As they go, they carry the pieces of leaf upright by their edges, and look as if they bore umbrellas or parasols to keep off the rays of the blazing sun in which they are working. That is how they get their common name.

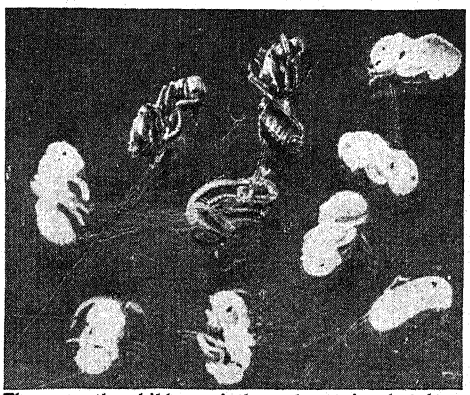
HOW THE ANTS STRIP FRUIT-TREES TO OBTAIN A ROOF FOR THEIR HOME

When these carriers arrive at the dwelling, other workers take the leaves from them, and carry them in for the builders to fit into their places in the dome. Soft pellets of earth are mixed with them, and they go to form a perfectly watertight roof to one of the most wonderful structures of the ant-world. It is very admirable, of course, as the

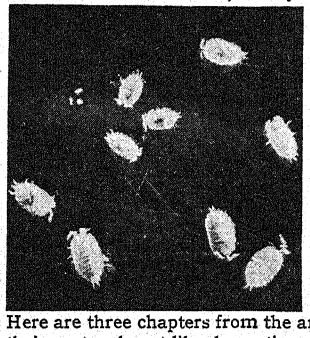
LIFE AND DEATH AMONG THE ANTS

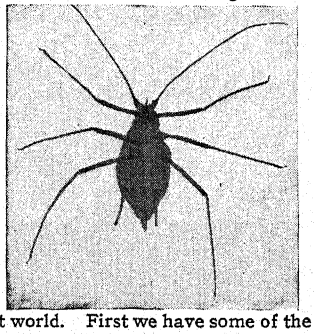


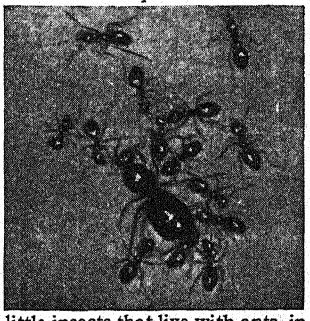
Men call these ants' eggs, but each is a chrysalis, with a baby ant inside, ready to come forth.



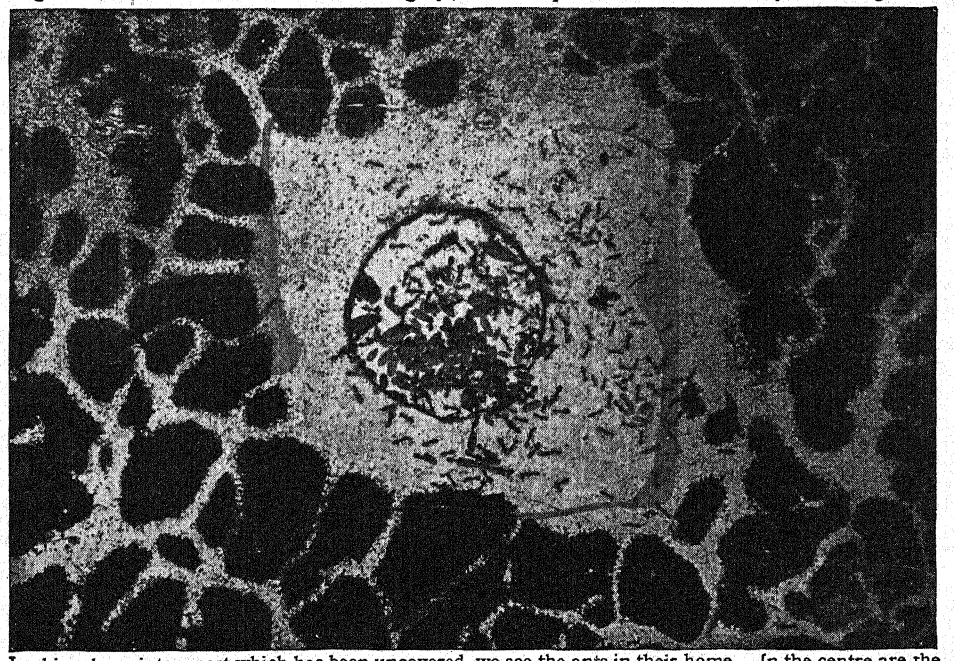
These are the children of the red ant in the chrysalis stage. The red ant emits poison if touched.







Here are three chapters from the ant world. First we have some of the little insects that live with ants, in their nests, almost like domestic animals in our homes; next we have an aphis, the ant's cow, very much magnified; and last of all we have a tragedy; a dead queen ant surrounded by mourning ants.



Looking down into a nest which has been uncovered, we see the ants in their home. In the centre are the queen and her attendants, and the baby ants and their nurses. The white spaces between the dark patches are the passages and tunnels, through which the ants make their way about their wonderful city.

work of insects, but it is costly to men. The leaves that these ants prefer are generally those of fruit-trees, or of coffee, and so many do they take that they strip and kill the trees.

These feats of the ants would be remarkable if the latter could be supposed to use any tools; but, as we know, they have nothing but their jaws and feet. It is time, therefore, that we paid a moment's attention to the structure of the ant. The body is in three parts: the head, the thorax, or chest, and the abdomen—the part of the body in which the food is digested. Part of the abdomen is very narrow and forms the waist. The head contains the eyes, and bears two pairs of jaws, the upper and lower lip, and also the antennæ. That is an ugly word with a diphthong at the end. It is the plural form of antenna, as larvæ is the plural form of larva, to which we shall presently come. Each antenna is very active and sensitive. It is supposed to be the organ by means of which ants "speak" to each other, by which they smell, and by which they hear, and also by which they keep themselves and their nests clean. The antennæ are those little branching, horny threads in front of the head of the ant which we see constantly waving to and fro as the insect moves.

Some ants have poison stings; others have simply poison glands, and inject their poison into the wounds which they inflict with their jaws. Some ants, among them the mound-builders, can squirt from their bodies a poison called formic acid. We have all heard of this acid, which men are now able to make from various substances. It is called formic after the Latin name for the ant, *formica*, because the acid was first obtained from the ant. The jaws of ants are remarkably strong. With these they can carry other ants bigger than themselves, and run away with weights which we could not lift if we were as small as ants. It is with this simple outfit that the ants work their wonders. A sluggish, weak-brained insect would be a very poor figure in the animal world with such capital, but the worker ant has a good brain, and it is that which makes her so wonderful.

HOW THE ANTS CARRY THE EGGS UPSTAIRS TO WARM THEM IN THE SUN

But how are the queen ant and her workers faring while we have been studying nests and their structure? The queen has begun to lay her eggs. The workers treat these with affectionate care, and their conduct shows us one of the reasons why they have so many galleries in their home. The eggs require a certain degree of heat and a certain degree of moisture. Now, if there were only one gallery in the city, it would become swamped in time of rain, and scorched by the sun in time of drought. When it rains the ants bring the eggs from the lowest gallery, if they are lying there, to one higher up; while, when the rain ceases, and the sun comes out, they carry them up to the top galleries, or even out into the open, so that they may get the full benefit of the sun.

The mother ant goes on laying eggs from time to time. The workers arrange the eggs according to their age. Those first laid are kept by themselves, while the second, third, and fourth batches are all arranged with the same care and order. The hatching of the eggs varies with the weather. It may take only fifteen days, or it may take three times as long. When the egg is hatched, there comes forth the larva, or grub, a little white, legless thing, looking like a small grain of wheat.

THE ANT GRUBS THAT SPIN ROBES OF SILK FOR THEMSELVES

Well, the larvæ, now that we know them by that name, have to be fed by the worker ants, just as the larvæ of the bee have to be fed by the worker bees. The ordinary full-grown ants eat insects, any sort of flesh-food that they can secure, vegetable matter, the nectar from flowers, and so forth. Then some have the supplies from their dairies, to which we shall presently come. The larvæ take only liquid food supplied by the worker ants.

While in the larvæ stage, the future ant grows to its full size. Some ants live through the whole winter as larvæ, but others make their next change in the course of six weeks or two months. The next stage is the chrysalis stage. The larva, having been abundantly fed and having reached its full size, turns, like the baby bee, into a chrysalis. Some of the larvæ spin for themselves robes of silk; others remain naked. It is while they are in this stage that the larvæ are collected by men and sold as "ant eggs" for birds and gold-fishes.

During its chrysalis stage the young ant does not take any food. But all the while the worker ants are unwearying in their loving attentions. They carry the chrysalises into the sunshine, and back to bed at night, shift them from gallery to gallery, so that proper heat and moisture may be obtained.

Finally, when the time comes, the worker ants help the young ants out of their coverings, so that they may appear before the rest of the family, weak and trembling, but perfect little ants with hearty appetites, ready, as soon as they are strong enough, to be taught the duties of the home, of hunting, of avoiding dangers, and, generally, of helping to keep the home happy and prosperous. If the young ants are males or queens, they have wings, and must be prepared for their wedding day. If they are merely workers, then they set to work at once.

When we understand something about ants, we notice, in opening a nest, that there are many other creatures in the nest, living quite happily, which clearly are not ants. There are eggs, too, which are not ant eggs. Where do they come from? Those eggs are the eggs of the aphis, the little insect which we all know so well by the name of honey-dew.

THE LITTLE COWS WHICH THE ANTS MILK AND KEEP UNDERGROUND

The aphis is an insect which lives upon the leaves of plants, or on grass, and other growths. It feeds upon the juice of the plant on which it makes its home, and converts that juice into honey. Now, if there is one thing of which ants are more fond than another, it is honey. Therefore, they make prisoners of the aphides—aphides being the plural form of the word aphis. The little brown ant climbs high plants and bushes to get at the aphides on them. On coming to one, the ant gently caresses the body of the aphis, strokes it, and taps it, and causes the aphis to part with the honey that it contains. This the ant drinks, then passes on to another aphis and repeats the operation of stroking and tapping.

Other species of ants do better still. They actually keep the eggs of aphides in their nests all winter. That is what happens in the case of the corn louse. This aphis lays her eggs in the nest of the common little brown ant. The wonderful part of the story is, that fond as they are of eggs the ants do not eat them. In the springtime the aphis eggs hatch, and the larvæ appear. When this happens the ants carry the larvæ out of the nest and put them safely on the roots of the knotweed to feed. There they keep them until the corn has been planted and has pushed its roots into the ground, and then these amazing little creatures carry their "cows" to their favorite feeding place on the roots of the corn.

HOW THE ANTS CARE FOR THEIR DAIRIES

The antennæ of the ant are the ant's fingers, and it is with these that she pats and strokes the aphis to make it yield the sugary fluid dear to the ant. Nor is this the most wonderful part of the dairy farm. The ants collect the eggs of aphides, and treat them with the same care that they bestow upon their own queen's eggs. They carry the eggs about from place to place, for warmth and shelter, and so forth, and they feed the young ones as they feed the baby ants. If danger comes, they fight bravely in defence of the young aphides, and some of the workers carry them off to a place of safety, while others continue the battle.

For several years Lord Avebury tried to get some aphides to live in his ant nests, but was not successful. At last he put near the nest some plants such as would be found near an ant nest in its wild state. The ants carried some young aphides to these plants, and soon Lord Avebury saw some aphis eggs on a daisy which was among the plants he had deposited. These eggs the ants did not suffer to remain on the stalk of the daisy.

INSECTS THAT ARE KEPT BY ANTS IN THEIR NESTS

In October they carried them into their nest, and carefully tended them all through the winter months. In the March the eggs hatched; the ants took the young aphides up from the nest, carried them out into the open, and placed them on the daisy on which they had been as eggs. Thus they would be sure of a supply of aphis honey for the whole of the summer, as well as of a stock of aphis eggs ready to be hatched in the following spring.

This is one of the true fairy tales of Nature which we may all see acted before our eyes if we have the patience to search any plant in the garden to which the ant follows the aphis. Nor is this the only wonder that we may note. We may

discover some other inmates of the ant's dwelling. If the visitors were not wanted, they would soon be killed, but there they are, as much at home as the ants, sharing the food of their protectors. Some of these insects share the warmth of the nest only through the winter months; some of them live out their little lives as permanent guests of the ants; others again leave the nest when they are grown up, but come back again to lay their eggs. These eggs are taken in charge by the ants as if they were their own, and when the larvæ hatch out, they are fed and nursed with the same care as the larvæ of the ants.

One result of the ant's love of honey is to be seen in an extraordinary insect called the honey ant, which is simply a living honey-pot. The worker ants keep these honey ants only to hold the honey that they collect. Full-grown honey-pots never leave the nest, but wait for the others to return home, and to take their honey from them. The honey is stored by the honey ants in their enormously swollen bodies, and when the less fruitful days come, the worker ants go to the honey ants and are fed by them from the rich store of honey collected in their bodies. The honey-pots live only for the service of their fellows, and are so dependent upon them that if they fall over they cannot get up unless they are helped. These ants live in the South-western states and Mexico and in Australia. This seems a rather rough-and-ready method of collecting food, but there are other ants which go to work more scientifically.

Ants that gather in harvests and store them in barns

The harvesting ants collect seeds of flowers and grass, and even grain, and store them in their underground barns. There is danger of course that when the seed is placed in the warm moist earth, it may sprout and grow, especially after rain. To prevent this, the wise little creatures have been seen carrying the seeds above ground to dry, and taking them back again to the store-rooms. Scientists who have studied them say that the harvesting ants of South Europe and Northern Africa know how to keep the seeds from growing by biting off the radicle, which, you know, is the part of the seed that is the beginning of the root. The ants bite the seeds to pieces before they feed the larvæ, and it is thought that they possess some means of turning the seed into starch or sugar to make it good food for the baby ants.

At the outer edge of the ring made by the harvesting ants of Texas, they deposit all the refuse from their nests. In this there is often some seed of their favorite grass, which takes root and grows, and from it a ring of ant-rice springs up about the nest. This is so often the case that for a long time many students of the ants thought that they really sowed the grass and cultivated their fields.

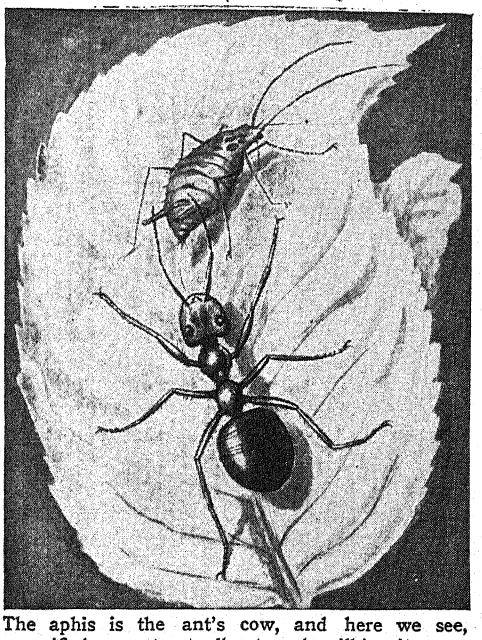
The parasol ants or cutting ants of Texas actually do cultivate a fungus or mushroom growth for food. These ants hide the entrances to their nests by carefully arranged " gates " of careless looking little heaps of twigs and leaves. When they go out on a foraging expedition, the gates are opened, and the ants come out in a body and march to a tree which they have marked for their own. They cut the leaves in the same way as their cousins the saubas. The leaves are carried in triumph to the nest to be chewed to a paper-like mass and are stored until the fungus grows.

The fierce battles of the ants, and the storming of their cities

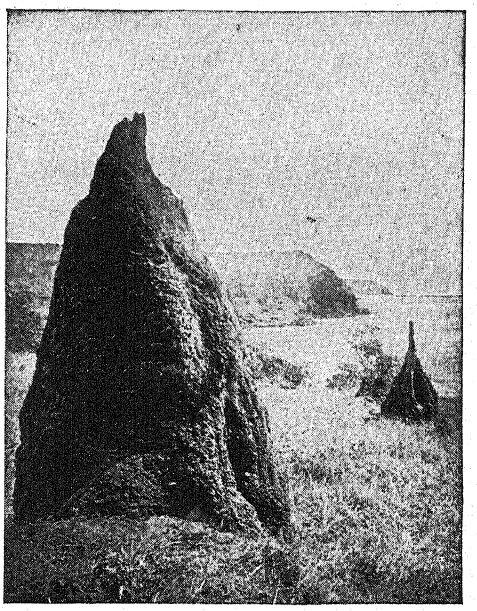
A point upon which we have no doubt is as to the wars and slave raids of the ants. The Amazon ants of Europe are terrible tyrants in this respect. They are big, and strong, and fierce, and prey upon ants weaker than themselves. On a certain day, that they seem to have agreed upon, they sally forth to another colony. They run along, smelling with their antennæ for the scent of their victims. When they have found the odor, they hurry straight to the nest, like a human army rushing on a city. The bravest of the ants in the garrison come out to fight, while the others seize as many of the larvæ and chrysalises as possible, and flee with them. Their only chance of escape is to climb trees or tall stems of grass, for the powerful Amazon ant cannot climb.

Meanwhile, a fierce battle is raging. The defenders fight bravely for their own lives, for the lives of their little ones, and for their homes. But it is in vain. The terrible jaws of the Amazons are too much for them. The invaders rush into the city. They kill all the adult ants they

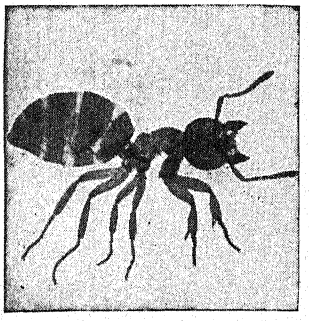
ROYAL ANTS AND AN ANT MILKMAID



The aphis is the ant's cow, and here we see, magnified, an ant actually at work milking its cow.



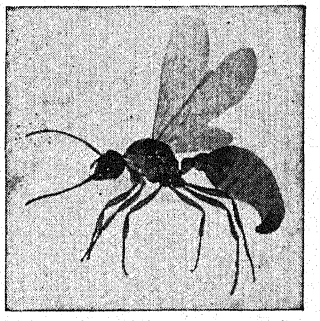
This great mound is the work of termites, commonly called white ants, which are very destructive.



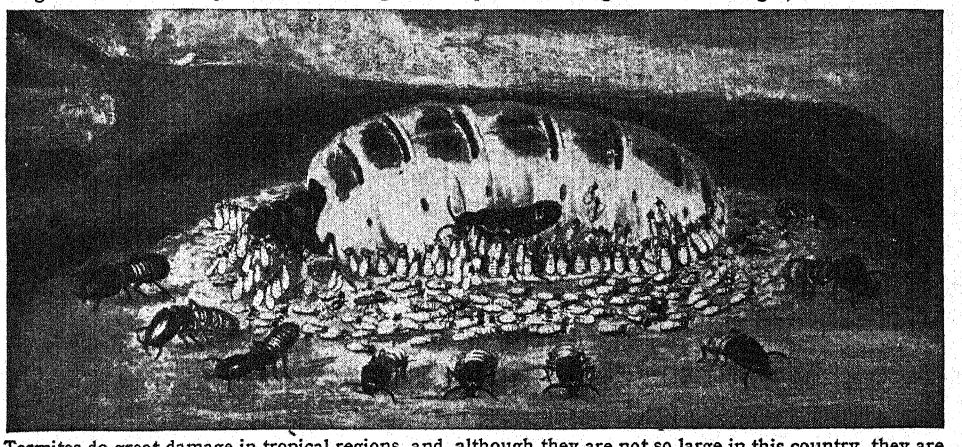
This worker ant is born without wings. Its antennæ may be seen.



This queen, on returning from her wedding tour, will pull off her wings.



The male ant passes one day in the sunlight, and then dies.



Termites do great damage in tropical regions, and, although they are not so large in this country, they are destructive in the southern states. The termites of this continent do not build mounds. This is the picture of the queen of a nest of tropical termites, surrounded by a band of workers who seem to be her guardians.

can find, then seize the eggs and larvæ, and dash off with them. Stragglers bravely follow and try to snatch the larvæ back again. A few succeed and dart up stems of plants, bearing eggs or larvæ with them, but only a few do this. Victory lies with the Amazon ants.

HOW THE AMAZON ANTS MAKE ANT SLAVES DO ALL THEIR WORK

When the stolen children come to life, they are slaves in the Amazon citadel. Born to slavery, they do not seem to mind their hard life, for they have never known what it is to be free. There is not an ant of their species in the nest which was born free—for all the full-grown ones have been killed. The slaves now do all the work of the city. The big Amazons depend entirely upon their slaves. They have even to be fed by them, and, when it becomes necessary to change the home for a new one, have actually to be carried by the humble servants whom they stole. They can kill and capture, but they would starve unless their slaves fed them.

THE BLIND ANTS THAT TRAVEL BY NIGHT AND EAT SNAKES AND PIGS

There are several kinds of these slave-making ants, and the way they fight is terrible. Some of them besiege a rival colony just like human soldiers. They surround the city, break down its walls, and make their way in as if they had all the implements of war.

It is not against ants only that ants make war. The terrible Driver ants of Western Africa make war on man. They are called Driver ants because they drive everything before them. The amazing thing is that they are blind, yet find their way with unfailing sureness. Traveling chiefly at night, they march in a column, with the large ones on the outsides and the smaller in the centre. They enter poultry-runs and eat the fowls, they raid pig-styes and eat the pigs. They kill every fly and spider in the house. They kill big snakes in the open; indeed, the big snake has such a horror of these ants that before feeding he looks about him to see if any are on the prowl. When he has eaten heartily, the snake must go to sleep, and then falls an easy prey to the ants.

HOW MEN ARE DRIVEN FROM THEIR HOMES BY ARMIES OF FIERCE ANTS

Heavy rains may flood their homes, but the Drivers cling together in masses as large as a base-ball and float to safety. They can cross streams by making bridges of their own bodies. They are good scavengers—most ants are—but they take so much of the good with the bad that they are a pest and a terror to man, who must give up his house while the Drivers are on the war-path.

The same remark applies to ants such as formerly troubled the island of Grenada. They descended from the hills like torrents, we are told, and the plantations, as well as every path and road, were filled with them. Rats, mice, and every kind of reptile were consumed by them, and birds, on alighting for food, were overcome and devoured. Streams of water failed to check them. The leaders rushed blindly into the water; myriads more followed them, till a bank was formed of the dead bodies, sufficient to dam up the water and allow the rest to pass over in safety. Fire was tried without success. They rushed into it in such masses as to put out the flames. A reward of $100,000 was vainly offered for their extermination. At last there came a frightful storm which tore up the homes of these ants and drowned them out, and so freed the island of a plague which had been too powerful for man.

WHITE ANTS THAT BUILD TALL MUD HUTS AND DEVOUR EVERYTHING THEY FIND

Men are still plagued by ants. The white ants, or termites, are among the worst. They are really not ants, and belong to a different order of insects. Bigger than ants and possessing more terrible jaws, they are called ants because they live in enormous nests like ants. Their homes are like great mud huts, but full of underground galleries. The domes are often twenty feet in height and one hundred feet across, and so strong that a man can jump on them without breaking them down. The termites bite through a man's clothing, and inflict painful wounds. They eat almost anything, and destroy everything that a man prizes, unless it be of mineral or metal.

This does not exhaust the list of ants and their ways, but it should serve to prove that the great skill and intelligence of ants, their virtues and their vices, do seem to place them close in the scale to the best of men and the worst of men.

THE NEXT STORY OF NATURE IS ON PAGE 3011.

AN IRISH ROMANCE OF ADVENTURE

CHARLES LEVER was born in Dublin, August 31, 1806, and was educated for the medical profession at the university of that town and in Germany. He practised as a doctor in different parts of Ireland and also lived in the backwoods of North America for some time. He had thus many interesting experiences to recount when he began story-writing, and he used them to good purpose. But best of all was his rollicking good-humor, which made his romantic stories of life in Ireland and adventure abroad the most delightful reading. Between 1840, when his first story, "Harry Lorrequer," was published, and his death abroad, at Trieste, June 1, 1872, he wrote some thirty novels, of which the most popular in his own day and still the most widely read is "Charles O'Malley, the Irish Dragoon." This was his second novel, having been published in 1841. Like most of his stories, it is written in the first person, and in re-telling it here we have closely followed the original.

CHARLES O'MALLEY

CONTINUED FROM 2868

MY story belongs to the opening years of the nineteenth century. When a mere child I was left an orphan to the care of my worthy uncle. My father, whose extravagance well sustained the family reputation, had squandered a large and handsome property in contesting elections for his native county, and in keeping up that system of unlimited hospitality for which Ireland in general, and Galway more especially, was renowned. The only legacy he left to his brother Godfrey was a boy of four years of age.

Godfrey O'Malley, some short time previously, had lost his wife, and when this new trust was committed to him he resolved never to re-marry, but to rear me up as his own child and the inheritor of his estates. Every one of these was burdened with heavy debts, but to do my uncle justice, he loved me with all the affection of a warm and open heart. From my earliest years his whole anxiety was to fit me for the part of a country gentleman, as he regarded that character.

At the age of seventeen, when my story opens, I rode boldly with fox-hounds; I was about the best shot within twenty miles of O'Malley Castle; I could swim the Shannon at Holy Island; I drove a four-in-hand better than the coachman himself; and from finding a hare to hooking a salmon my equal could not be found from Killaloe to Banagher. These were my chief accomplishments, but the parish priest had taught me a little Latin, a little French, a little geometry, and a great deal of the life and opinions of St. Jago, who presided over a holy well in the neighbourhood and was held in very considerable repute.

When I add to this account of myself that I was nearly six feet high, with more than a common share of activity and strength for my years, and no inconsiderable portion of good looks, I have finished my sketch, and stand before my reader.

At the age which I have named, a turning point came in my life. I was commissioned to seek for Mr. Godfrey O'Malley the political support of a distant relation, Mr. Matthew Blake, from whom my uncle had been estranged for several years, but who might, it was thought, be agreeable to meet a younger branch of the family, with whom he had never had any quarrel. At Mr. Blake's house I was introduced to Sir George Dashwood, a tall, singularly handsome military officer of about fifty, who was accompanied by his daughter. Lucy Dashwood had the sweetest eyes that ever beamed beneath a forehead of snowy whiteness, over which dark-brown and waving hair fell, less in curls than in masses of locky richness. Although very young,

she seemed in the bloom of womanhood; while her gay and sprightly manner indicated all the charm which only young girls possess, and which, tempered with perfect good taste and accompanied by beauty and no small share of talent, formed an irresistible power of attraction.

Mr. Blake's guests also included a tall, handsome man of about five-and-thirty—Captain Hammersly—who, as I was presented to him, scarcely turned his head, and gave me a mere half-nod of very doubtful interest.

CHARLES O'MALLEY FALLS IN LOVE AND WISHES HE WERE AN IRISH DRAGOON

As I turned from the lovely girl, who had received me with marked courtesy, to the cold air and repelling manner of the dark-browed Captain, the blood rushed to my forehead; and I eagerly sought his eye, to return him a look of defiance and disdain, proud and contemptuous as his own. Captain Hammersly, however, never took further notice of me till after the hunt on the following day, when I led him over the very roughest part of the country, and when I broke my head and he broke his arm.

My feelings may be imagined when, on learning that I was destined to be a lawyer, Miss Dashwood expressed the opinion that she should never have thought of my being anything "so stupid."

"Why," said her father, "what would you have a man be?"

"A dragoon, to be sure, papa," said the fond girl, as she pressed her arm round his manly figure, and looked up in his face with mingled pride and affection. Her father, Sir George Dashwood, was Commander of the Forces, while Captain Hammersly was an officer in the Light Dragoons. A few days later I had occasion to leave Gurtnamorra, as the result of an incident at dinner. In a moment of excitement I hurled a glass at a Mr. Bodkin, who delivered himself of a sentiment which I regarded as an insult to the O'Malleys. A duel followed, in which I shot my opponent, leaving him with his friends for dead. The sensations I experienced as a result of this encounter made a lasting impression on my mind, although my opponent was a duellist and fully relied upon shooting me. It was with inexpressible relief I learned soon after that the wound was not a mortal one. Shortly afterwards Captain Hammersly called at O'Malley Castle. He told me he had just had an order to join his regiment for service in the Peninsula, which had been invaded by the French.

"I could not," he said, "leave the country without shaking hands with you. I owe you a lesson in horsemanship, and I'm only sorry that we are not to have another day together. I am sorry you are not coming with us."

"Would that I were," said I, with an earnestness that almost made my breath start.

"Then, why not?" said he.

"Unfortunately," I replied, "my uncle, who is all to me in this world, would be quite alone if I were to leave him, and I know he dreads the possibility of my suggesting such a thing."

"Very hard," said he, "but I believe you are right; something, however, may turn up yet to alter his mind, and, if so, and if you do take to dragooning, don't forget George Hammersly will be always most delighted to meet you; and so, O'Malley, good-bye." He turned his horse's head, and was already some paces off when he turned to my side and added in a lower tone of voice:



Charles O'Malley was a bold and dashing horseman.

"I ought to mention to you that there has been much discussion on your affair at Blake's table, and only one opinion on the matter among all parties—that you acted perfectly right. Sir George Dashwood — no mean judge of such things — quite approves of your conduct, and I believe wishes you to know as much; and now, once more, good-bye."

Now, Sir George Dashwood was the opponent of my uncle at the ensuing election, but when he found how strong the feeling was against his candidature, he retired gracefully. During the excitement of the contest I saved Miss Dashwood from a terrible death, and after I had been in Dublin some time for the purpose of pursuing my studies for the legal profession, Sir George succeeded in inducing my uncle to yield to my wishes, and secured for me a cornetcy in the 14th Light Dragoons.



Charles declares his love to Lucy before leaving Dublin.

A day or two later I found an opportunity of meeting Miss Dashwood, who was riding in Phœnix Park. Her astonishment at seeing me so suddenly—a college friend had, on my behalf, led her father away on some pretext—increased the confusion from which I felt myself suffering, and for some minutes I could scarcely speak.

OUR HERO JOINS THE DRAGOONS AND GOES OFF ON ACTIVE SERVICE

At last I plucked up courage a little, and said: "Miss Dashwood, I have looked most anxiously, for the last four days, for the moment which chance has now given me. I wished, before I parted for ever with those to whom I already owe so much, that I should at least speak my gratitude ere I said good-bye."

"But when do you think of going?"

"To-morrow; Captain Power, under whose command I am, has orders to embark immediately for Portugal."

I thought—perhaps it was but a thought—that her cheek grew somewhat paler as I spoke. But before leaving I managed to declare to her that my love for her would be the source and spring of every action in my life.

How strange a contrast to the dull monotony of our life at sea did the scene present which awaited us on landing at Lisbon! The whole quay was crowded with hundreds of people eagerly watching the vessel which bore from her mast the broad ensign of Britain. Dark-featured, swarthy, moustached faces, with red caps rakishly set on one side, mingled with the Saxon faces and fair-haired natives of our own country. Men-of-war boats plied unceasingly to and fro across the tranquil river, some slender reefer in the stern-sheets; while behind him trailed the red pennon of some "tall admiral." The din and clamour of a mighty city mingled with the far-off sounds of military music; and, in the vistas of the opening streets, masses of troops might be seen, in marching order; and all betokened the near approach of war.

From Captain Power I received two packages, with instructions to deliver them—the one to Captain Hammersly from Miss Dashwood; and the other to La Señora Inez da Ribiera, the daughter of a wealthy Portuguese don. The first package contained, though I knew it not at the time, a letter in which Miss Dashwood, in a manner as gentle as was possible, declined the hand of Captain Hammersly, who was, I then believed, my favored rival. The other communication was a love-sick epistle from a young midshipman. Circum-

stances throwing me into the society of the Señora, whom I greatly admired but did not love, I became, when I had delivered the package to Captain Hammersly, the object of his immediate hatred. He misunderstood my feelings for the Portuguese beauty, and I at the same time misunderstood his. Thus it was we quarreled.

Meanwhile, at the passage of the Douro, I saved General Laborde's life, and this secured for me a lieutenancy in my regiment. The promotion being followed so soon by the quarrel, a gloom was cast over me which I had great difficulty in overcoming. While on special service some time later, a young Frenchman, who had encountered the displeasure of Napoleon when acting as a page in attendance on the Emperor, fell into my hands. I befriended him and enabled him to return to his own ranks, an act on my part which had far-reaching consequences.



Charles O'Malley betriends a wounded French officer.

WHAT MICKY FREE THE SERVANT DID WITH WELLINGTON'S DESPATCHES

The battle of Talavera followed, and later I was wounded in a skirmish before Ciudad Rodrigo, which made me but a spectator of the battle of the Coa. I returned to Lisbon an invalid. And here it happened that I was introduced to Miss Dashwood by the Señora in circumstances which caused Miss Dashwood to make the same mistake as to my feelings for the Portuguese lady as Captain Hammersly had already made. At this time I knew not if Lucy Dashwood really cared for me. Now I knew, however, that if she did care for me, her own wrong impression of my feelings for the Señora, coupled with false stories from others, had wrecked all my fondest hopes. Letters received from home through her hands confirmed me in this view, and in my weakened state I fell into a severe illness at a moment when Sir George Dashwood had invited me to join his staff. After the battle of Fuentes d'Onoro I was gazetted to a captaincy. I had by this time come under the direct notice of Lord Wellington, uncomfortably once through the mixing of official despatches by my servant Micky Free, who unconsciously forwarded to headquarters a nonsensical letter which he had written home about my exploits, the despatch containing the names of killed and wounded going in place of his extraordinary effusion to his sweetheart in Ireland. Happily, friendly influence saved me on this occasion from any worse consequences than the inconvenience of a temporary arrest.

The storming of Ciudad Rodrigo gave me an opportunity of displaying myself to better advantage, but I now received a letter which set forth the great need of my return to my uncle, and with my leave of absence I received the honour of being made the bearer of despatches to the Duke of York, to whom I had thus the happiness of being the first to bear the news of our great victory.

THE IRISH DRAGOON COMES HOME AGAIN AND LIVES THE LIFE OF A HERMIT

I did not reach O'Malley Castle before my uncle's death. The responsibilities which this event threw upon my shoulders caused me to sell my commission and to devote myself to the care of my tenantry and the improvement of the encumbered estates. I lived the life of a hermit, and denied myself all the pleasures of social intercourse. Indeed, my life seemed to have been a failure. Although, before I left Lisbon after the unhappy meeting with Miss Dashwood,

I had found it possible to make my peace with her, her father had been given cause to regard me with grave disfavor. It appeared that he had made an offer to buy a part of my uncle's property. He made the offer with the best of intentions. It was received with scorn as an attempt on the part of a stranger to take advantage of my uncle's embarrassments, and a challenge was sent to him, together with an intimation from my uncle's closest friend, to the effect that in what they did they had my entire approval.

I had the gratification of seeing my estates gradually improve, and with infinite address the Mr. Blake to whom I referred in opening my story endeavored to throw me into the company of his daughters with the object of marrying one of them to me. The youngest of them, happily unconscious of her father's wish in this connection, became attached to me. I did not see whither her feelings were carrying her, but grew to like her companionship.

When I appreciated my predicament I extricated myself as well as I could, and the news just then arriving of Napoleon's escape from Elba, and of the operations which resulted, I once more sought service, proceeding first to Brussels, where I saw Miss Dashwood at



Charles is accepted as Lucy's sweetheart at last.



Wellington giving orders to Charles O'Malley.

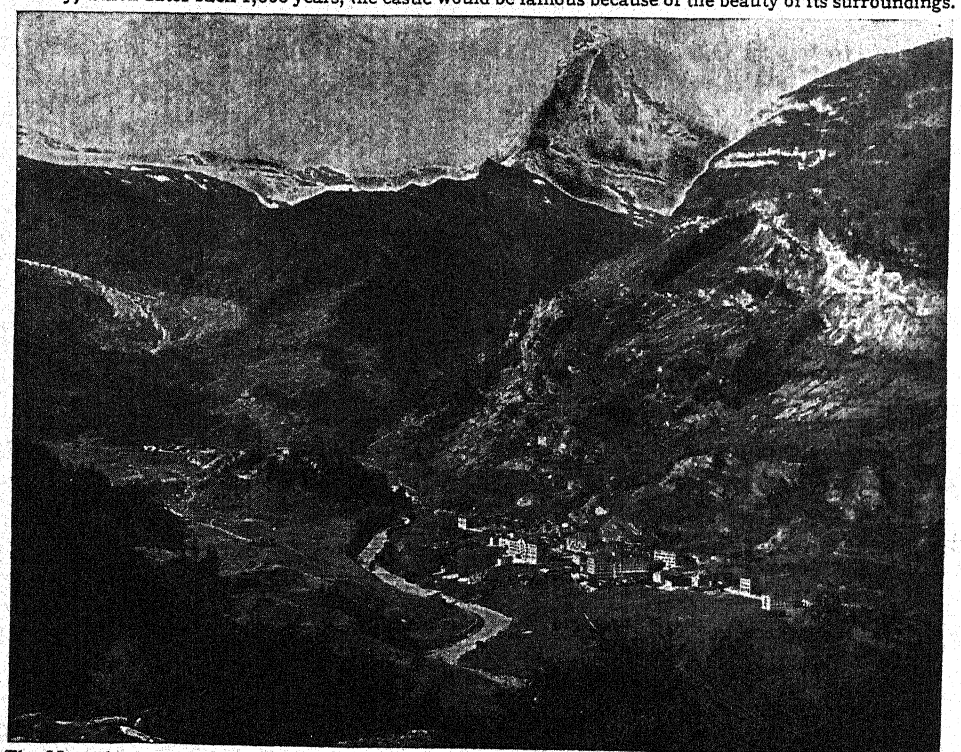
the famous ball given by the Duchess of Richmond. Being captured by the French at the battle of Quatre Bras, I was enabled, through the agency of a second encounter with my former acquaintance the ex-page of the Emperor, to save the life of Lucy's father. My friend the ex-page had arranged a clever plan of escape by securing me a French uniform, and when telling me of the scheme he was overheard by an elderly prisoner, who had been captured with despatches upon him which would likely have led to his being executed as a spy. The prisoner begged that I would take a letter to his daughter. But, to my amazement, I recognized him as Sir George Dashwood, and insisted on his taking advantage of the scheme for my own escape, while I remained a prisoner, to be rescued, happily, soon after the opening of the great battle of Waterloo, towards the close of which I charged the enemy by the side of Captain Hammersly, who rode to death. Happily, matters between myself and the Dashwood family being satisfactorily cleared up, I was able to present myself as suitor for the hand of Lucy. And with his consent the brave old General gave me his blessing.

THE NEXT STORY OF BOOKS IS ON PAGE 3309.

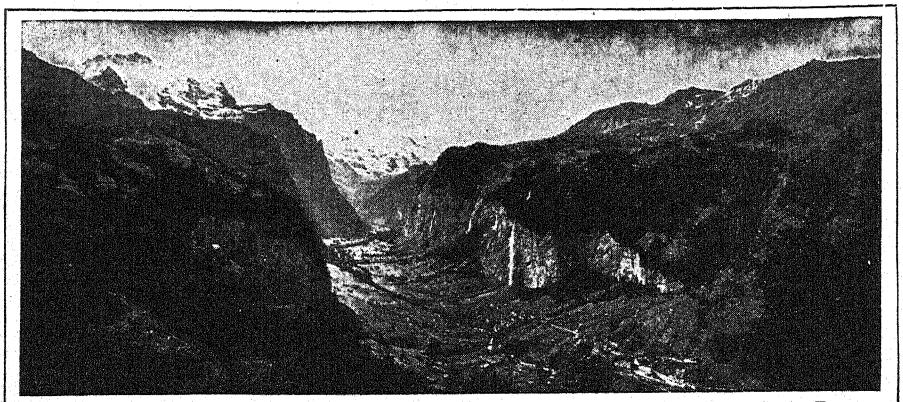
A FAMOUS CASTLE & A MIGHTY ALPINE PEAK



The quaint old castle of Chillon, on the Lake of Geneva, has become famous through Byron's poem "The Prisoner of Chillon," some lines from which we find in another part of this book. But, apart from its history, which dates back 1,000 years, the castle would be famous because of the beauty of its surroundings.



The Matterhorn, which we see towering before us in this picture like a mighty obelisk, is the most impressive and inaccessible of all Alpine peaks. It rises 14,837 feet above the sea-level, and was first ascended, in 1865, by a party of four Englishmen with three guides. In the descent three of the travelers and a guide were killed, owing to the breaking of a rope. Nestling below is the tiny town of Zermatt.



Typical scenery in the Swiss Alps, showing the Jungfrau, one of the grandest peaks in Europe.

SWITZERLAND OF THE SNOWS

CONTINUED FROM 2906

"BOYS and girls come out to play" is the standing invitation from the little central country, Switzerland, to the nations of the world. They respond very willingly, thousands and thousands of them, not only from the neighboring countries of Germany, France, Italy, Austria, but through them — for Switzerland has no sea-coast — from Holland, Great Britain, and the United States; from Russia, and everywhere else.

We have not far to look to find out the principal reason why this small country, about half the size of Maine, is so attractive. The posters of the railway and tourist companies, who make it possible for tired people to go quickly and cheaply to "play" out of their own country, as well as the advertizements of some of Switzerland's chief industries, all give us a broad impression of grand scenery, very different from that usually before the eyes of dwellers in the cities and country parts of our own land. Dazzling white mountains stand out against the bluest of skies; dark forests contrast with bright green meadows down the hill-sides, and reach to the shores of wide lakes of ever-changing color, into which pour the foaming white rivers.

As we look more closely at these striking and beautiful features on the face of Switzerland, we shall realize what an influence the relief of the country has had in shaping its story. It can well say "My face is my fortune," not only because its beauties year by year attract visitors, who spend in it an enormous amount of gold, but chiefly because its protecting, invigorating mountains, its fertile valleys and useful lakes, have enabled the Swiss themselves through the centuries to develop into a sturdy, free, industrious nation. There are to-day about four millions of Swiss—much less than the population of New York; but they live independent though surrounded by powerful neighbors.

Before glancing at the story of the past—which is chiefly the story of their relations with these immediate nations—let us try to get a clear idea of Switzerland itself with the help of a relief map, if possible, such as those in the educational departments of our great museums. We have already seen that the great solid mass of the Alps, the highest land on the Continent, stretches across Europe from the Rhone to the Danube. Its western end is in France, where, south of Lake Geneva, the highest peak of all, Mont Blanc, rises over 15,000 feet. Its eastern end is Austrian Tyrol, of

which we see pictures on an earlier page. It is the central part of the great highlands that cover more than half of Switzerland with grand ranges of mountains, the tops of many being above the line of perpetual snow. Amongst others there are Monte Rosa, nearly as high as Mont Blanc, and the Matterhorn, near where Switzerland touches Italy, and the Jungfrau and many more about forty or fifty miles north of the frontier.

THE BLUE RIVERS OF ICE THAT SLIDE SLOWLY TO THE SEA

Valleys separate the ranges and groups of mountains; some a mere cleft in the bare rocks; some wider, and green with grass and gorgeous with wild flowers in spring and summer; others again are filled with deep, dark forests.

In nearly all the valleys are leaping and dancing streams. Very high up the rivers only slide and crawl a few feet in a year, for they are frozen hard. These glaciers, or rivers of ice, some of them twenty miles long, are amongst the great wonders of the Alps. Their surface is usually very rough and heaped up, like waves suddenly frozen hard. The edges of the ice, seen in the great cracks called crevasses, are of a vivid blue color, as they are also at the end of the glacier, where the warmer air forces the ice king to loose his grip, and the water escapes on its journey to the sea.

Comparatively few of Switzerland's visitors climb over the glaciers and up the highest peaks. It needs strength and endurance to climb in the intense cold, roped to guides, who show the way and cut steps when needed in the ice. But those who do go enjoy it amazingly, so fine is the pure air, so grand the immense views and the solemn stillness and beauty of the white world.

THE GREAT WHITE WORLD BATHED IN GLORIOUS RED AND GOLD

It is not always white, though, for at sunrise and sunset in clear weather both sky and snow are bathed in glorious color—rosy red and gold. The stillness, too, is often broken by the thunderous roar of avalanches—masses of snow that slip down the mountain just as snow does off a roof, overwhelming any life that may be below.

Between the High Alps and the plateau, or high plain, of Switzerland, there is a beautiful mountainous district which reminds us of Scotland, with its picturesque rocks and pine-woods, heathery moors and mountain lakes. In many of the valleys, and round the lakes of Thun, Brienz, and Lucerne, thousands of visitors find villages in which to stay. There are even hotels at the tops of some of these mountains, such as Pilatus and the Rigi, with wonderful railways which climb up the steep mountain-sides from the valley below.

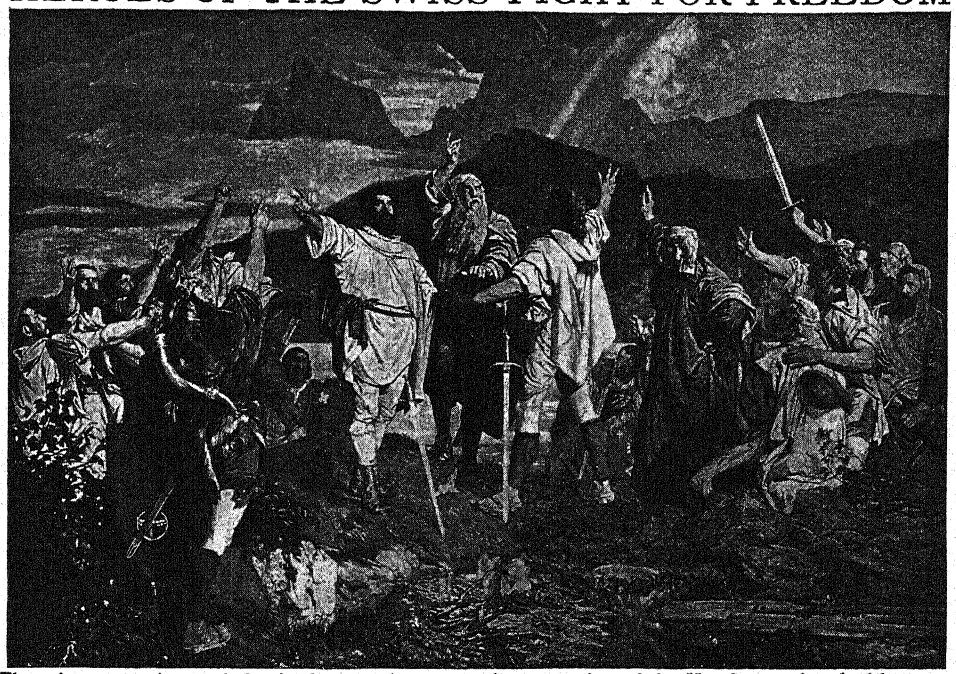
In the plain of Switzerland, which lies between the Alps and the Jura Mountains to the north, are little wooded hills and green slopes, wide fields shaded with fruit-trees, or richly cultivated with crops of many kinds. The country is now covered with towns and villages; everybody is busy, either working in the fields or in the towns at various manufactures. At the south-west of the plain lies the great Lake of Geneva, so large that it takes a fast steamer two hours to go from one end to the other. Geneva is at the south corner near France. At the north-east of the plain is Lake Constance, whose further shore is in Germany. Between these two largest lakes are many smaller ones, such as those of Neuchâtel, Bienne, Zürich.

THE RIVER RHONE THAT RISES IN A BEAUTIFUL BLUE GROTTO OF ICE

All the chief towns of Switzerland lie round the lakes, or on the rivers of the plain. These rivers rise within a few miles of one another in a great central mountain mass near St. Gothard, and run in widely different directions. There is the Rhone, rising in a beautiful blue grotto of ice, at the end of the Rhone glacier, and running along a wide and fertile valley to Lake Geneva. It is most interesting to watch the different colors of the water of the river as it pours into the lake. Soon after leaving the other end of the lake, the Rhone passes into France on its southward journey to the Mediterranean.

The upper Rhine takes a north-easterly course to Lake Constance, and after leaving it at the further end, makes the wonderful falls at Schaffhausen, and later, turning north at Basel, becomes the German Father Rhine. The river Ticino rises near the Rhine, and flows down the south slopes of the Alps, leaving Switzerland as it passes through Lake Maggiore to join the Po, the great river of North Italy.

HEROES OF THE SWISS FIGHT FOR FREEDOM



There is a story that early in the fourteenth century the oppression of the Hapsburg rulers had become so unbearable to the Swiss that three brave patriots determined to resist. They called together a few trusty countrymen, and in a lonely meadow at Ruetli, with none looking down upon them save God, they took a solemn oath to preserve the freedom of their nation. Others say this happened earlier.



Legend says that one of the Swiss patriots who took the oath at Ruetli to fight for freedom was William Tell, whose story we read on page 1703. He was compelled by a brutal governor to shoot an apple placed on his son's head, and the rejoicings of the people when Tell succeeded in transfixing the apple without hurting the boy were very great. Whether or not the story is true, it shows the spirit of the Swiss people.

The Inn, which we have already seen at Innsbruck, in the story of Austria-Hungary, on its way to join the Danube, rises not far from the Rhine. Another important Swiss river is the Aar, which rises near the Rhone, and flows through Brienz and Thun, and then in a winding course to the Rhine past Schaffhausen. Berne, the capital of Switzerland, is on the Aar.

MEN WHO LIVED ON PLATFORMS BUILT IN LAKES, TO ESCAPE FROM WILD BEASTS

Now, in the Museum of Berne there is a deeply interesting model of a settlement built on a lake. It shows us how piles were driven into a soft shore where the water was shallow, how a floor of wood was fastened above the piles, and how, on the floor, the huts were built of wood and hurdles, and roofed with rushes. There was a gangway easily removed to connect with the shore. As far as we know, the people who lived in these lake-dwellings were the earliest to settle in the country. At any rate, it is believed that their times date back to a thousand years before Christ. Life was very wild then in Central Europe, and it is supposed that men made their homes in this fashion to get out of the way of wild animals and their wild neighbors, just as tribes in Africa do to-day.

We should know very little about the lives of these folk if their possessions had not been preserved by fire. This sounds strange, but when the flames were consuming these old homes the remains became crusted with charcoal as they fell into the soft bed of the lake beneath, and so have lasted safe and perfect to these days. What a fine time the lake-dwelling children must have had, playing about in the boats, or taking a run on the shore, or sitting round the cosy fireside at evening, when the day's work was finished.

RELICS OF THE SWISS LAKE-DWELLERS THAT MAY BE SEEN IN LONDON TO-DAY

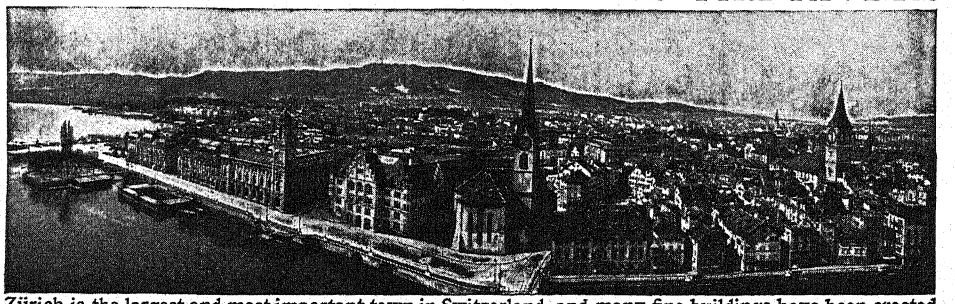
In a large case in the Prehistoric Room in the British Museum, labeled "Swiss Lake-Dwellings," may be seen the nets, the blackened stones, and raspberry-seeds and ears of grain, the fishing boat and hooks, the pottery, small mugs for the children, and tiny bracelets for their arms, amongst many other things that make this far-away time quite real to us. These settlements have been found in the lakes of the plain, such as those of Geneva, Neuchâtel, Bienne, and Zürich. The next race of men who made their home in the plain of what we now call Switzerland were the Celts, in many ways like those who lived in Britain. They were very brave and warlike, fond of ornaments and fine armor, and were led by Druid priests. Gradually they were subdued by the all-powerful Romans, who adopted the same plans as they did later in Britain. Fine roads were made across the high passes of the Alps from Italy to the towns that rose up in the plain under Roman rule.

The chief roads were over the St. Bernard Pass and the Julier Pass—where there are still two milestones of the emperor in whose reign Christ was born. In the museums of all the large towns of Switzerland are many remains of the conquerors of the Helvetians, as they called the chief of the Celtic tribes. Along the beautiful and sheltered shores of Lake Geneva the rich Romans had fine villas, as they had in France, Britain, and other favored spots, and to this day there are ruins of temples and other buildings belonging to the Roman times.

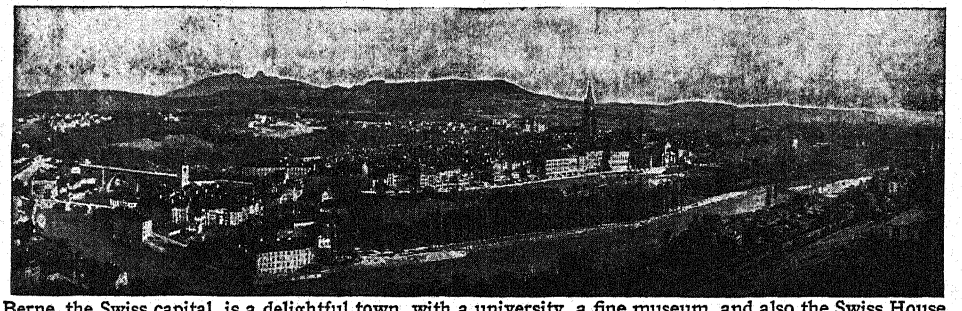
HOW VARIOUS TRIBES WERE BLENDED TOGETHER TO FORM THE SWISS NATION

East Switzerland was never so thoroughly Romanized and subdued as the western part. Hence, when the Teutonic or German tribes succeeded at last in settling in the country—the power of Rome had died out—the Alemanni in the north-east entirely absorbed the Celts who lived there, and who had but little power of resistance, and planted a true German people, with their own laws, language, manners, and customs. With the Burgundians—also a German tribe, who settled in the south-west — it was different. While they brought fresh vigor into the country, they were influenced in their turn by the civilization of the Romanized Celts, and were gradually blended with the earlier settlers, thus forming a new people, the foundation of whose speech was Latin. This was the beginning of a German speech and a Latin speech, which developed into French, being spoken side by side in the little central country. There is no Swiss language to-day. The larger eastern part still speaks German, like the country it borders on, and the smaller western part,

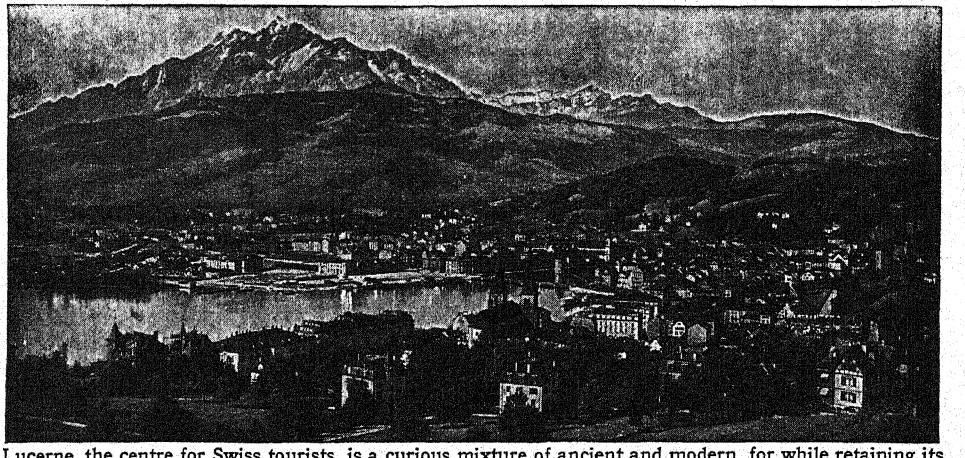
SWISS TOWNS AT THE BENDS OF THE RIVERS



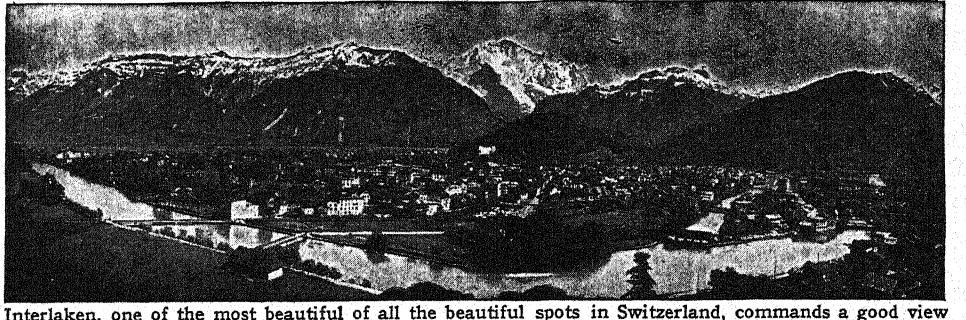
Zürich is the largest and most important town in Switzerland, and many fine buildings have been erected in recent years. It is the centre of Swiss silk manufacture, and Zwingli, the Swiss reformer, lived there.



Berne, the Swiss capital, is a delightful town, with a university, a fine museum, and also the Swiss House of Assembly. It is situated at a bend of the river Aar, and commands a fine view of the Alps.



Lucerne, the centre for Swiss tourists, is a curious mixture of ancient and modern, for while retaining its old walls and watch-towers, it is well equipped with modern improvements, such as electric lighting.



Interlaken, one of the most beautiful of all the beautiful spots in Switzerland, commands a good view of the famous Jungfrau peak, 13,669 feet high, the white mountain seen in the middle of this picture.

The photographs on these pages are by the Photochrome Co., and Wehrli Aktien Gesellschaft, Zürich.

touching France, speaks French. Where the south border now runs down into Italy, the people speak Italian.

For long years the two races were at war with each other, then both were subdued by the Franks, who governed by their officers and counts. The great Charlemagne, whose dominions extended from Spain to Hungary, from Denmark to Rome, spent much time in Switzerland, chiefly, it is believed, at Zürich.

THE IRISHMAN WHO FOUNDED A SWISS ABBEY AND FORMED A GREAT LIBRARY

Many great monasteries and abbeys were founded or made more important in Charlemagne's days. One was that of St. Gall, founded by an Irish missionary, in which learning was carried on, and valuable books written and collected during the years of warfare and trouble that fell upon the country. At St. Gallen, now one of the chief industrial towns of Switzerland, many of these old manuscripts are still to be seen.

When Charlemagne's dominions were divided, the east and west divisions of what is now Switzerland fell apart again, and boundaries and rulers were constantly changing, and the people had a desperate struggle to keep any of the old rights, so dear to the hearts of all nations of German descent. Powerful churchmen and great families who had secured large grants of land all managed to destroy the liberties of those who lived on the soil, just as in England, about the same time, the Normans were overcoming the English.

When the German emperors took possession of the country they governed by nobles, who became more and more powerful and ambitious as the power of the Holy Roman Empire declined. It was the growth of free towns that helped the people to resist their lords.

THE FINE OLD TOWNS OF SWITZERLAND THAT TELL US OF THE PAST

These towns were walled, and they had charters which gave them freedom to trade and make money, like the free towns of Germany. Fribourg, meaning "free city," and Berne date from the twelfth century, and in their fine old buildings and handsome fountains we have many reminders of the far past. It was also in this century that the Crusades were preached in Switzerland with great fervor, and many brave men rose up and went, never to return. In the next century comes the rise of the Hapsburg family, from amongst a crowd of nobles on Swiss soil, all trying by conquest, marriage, purchase of lands, or unjust takings, to get the lead. We have already seen the brilliant success of Rudolph of Hapsburg, who rose to be German Emperor. In Switzerland he waged war with Berne, forced lands from nobles and abbots, seized farms and estates, and his heavy hand was felt all over the country. Perhaps because it was so heavy the people resolved to bear it no longer. Anyway, the love of freedom seemed to revive, and their determination raised an enduring obstacle to Hapsburg ability and energy.

One of the tributaries that makes the Aar so large and full when it joins the Rhine is the Reuss. Leaping down the rough sides of the St. Gothard like the other rivers, it passes on through a long narrow lake with many branching armlets, and then out at the further end with rapid swing, past the beautiful old town of Lucerne.

THE FIERCE FIGHT FOR SWISS FREEDOM THAT TOOK PLACE ROUND A LAKE

It was round the shores of the Lake of Lucerne, sometimes called the Lake of the Four Cantons, because four cantons, or counties, share its shores, that the brilliant struggle for Swiss independence was carried on in the thirteenth and fourteenth centuries against the tyranny of the Hapsburgs.

Three out of the four cantons formed a league. They were Schwyz, which has given its name to the whole country, Unterwalden, and Uri. The men who lived in these three famous states, or cantons, were descendants of the freedom-loving Alemanni, and for them the lake was a common outlet and rallying place. Their towering mountains and valleys, hidden away from the rest of the world, had kept them distinct and self-reliant, and their bodies were hardy from the perpetual struggle to make their living under difficulties; their spirits were bold and fearless from constant contact with danger, which each had to meet for himself. Added to this was the intense love of country which makes brave men dare anything, just as a mother knows no fear when she has to protect her child. When once we see

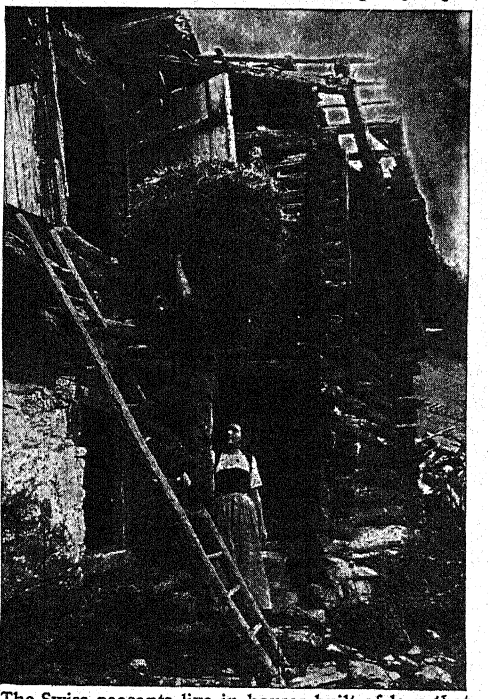
SWISS PEASANTS AT WORK AND PLAY



Living for centuries in their romantic valleys, amid grand and lofty mountains, the Swiss people, although made up of different races, have acquired a national character. They have a buoyant love of liberty, and delight in a life as free as the air. Here we see a Swiss peasant family at play upon one of their grassy slopes.



Swiss women work as hard as the men. Here we see a mother carrying milk from the pasture. She is giving a flower that she has picked to her little child.



The Swiss peasants live in houses built of logs that look as rugged as the mountains on which they stand. Here a peasant is storing fodder for winter.

this glorious country, its towering mountains, frowning, steep rocks, widespread forests, lovely green slopes, orchards and meadows, and the unspeakable beauty of the lake with its soft blue distances and deep shadows, it is easy to understand the patriotism of the three forest cantons.

HOW THREE MEN MET IN THE MOUNTAINS AT NIGHT TO SAVE THEIR COUNTRY

Many of the romantic stories that have been handed down through the centuries about these times are now considered untrue. But they are so firmly embedded in the country's story, and illustrate in such a graphic way the spirit of the times when the union, or confederation, of the states was taking place against a powerful enemy, that we still love them, even if the details are not true. Here is one of the stories.

On a green meadow, above the Uri branch of the lake, three patriots who had suffered greatly from Hapsburg rule met in the still, dark nights, and talked over their wrongs, and vowed to free their country from oppressors and to restore its ancient liberties. Friends joined them till the band became thirty-three. As these men raised their right hands to heaven, making covenant together, "One for all, and all for one," the sun shot its first cheering rays over the mountain-tops, and seemed to promise success. The three men of Ruetli have long been national heroes.

The romantic story of William Tell, who shot the apple from his son's head, is told on page 1703 of this book. All over Switzerland are statues and pictures to illustrate the act. One of the most beautiful poems of Schiller has spread the story or legend of William Tell all over the world.

A WHIRLWIND OF MEN THAT RUSHED DOWN UPON FRIGHTENED AUSTRIANS

In 1315 the spirit of resistance to the Hapsburgs led to the great battle of Morgarten, and this brilliant victory began a series of successes which for two centuries increased the feeling of union, as well as the military glory of the Swiss cantons. At Morgarten the large Austrian army was overwhelmed and destroyed in a narrow pass by the mountaineers, few in number. They lay in wait on the heights, and at the right moment hurled down on their foes stones, rocks, trunks of trees. Then the main body of the men of Schwyz and Uri rushed like a whirlwind down the hill on the terrified Austrians.

Some seventy years later the Austrians were again defeated. The battle of Sempach is famous for the brave deed of Arnold von Winkelried, about which we read on page 132.

Towards the middle of the fifteenth century there were eight cantons joined in union, and such was their power that they succeeded in getting the better, not only of the Austrian Hapsburgs, but of Charles the Bold, Duke of Burgundy, who harassed the west side of Switzerland nearest to France. At last the unity and bravery of the Swiss succeeded in having their independence of the emperor formally recognized, though in name they were attached to his dominions till the Peace of Westphalia, in 1648, which ended the Thirty Years' War.

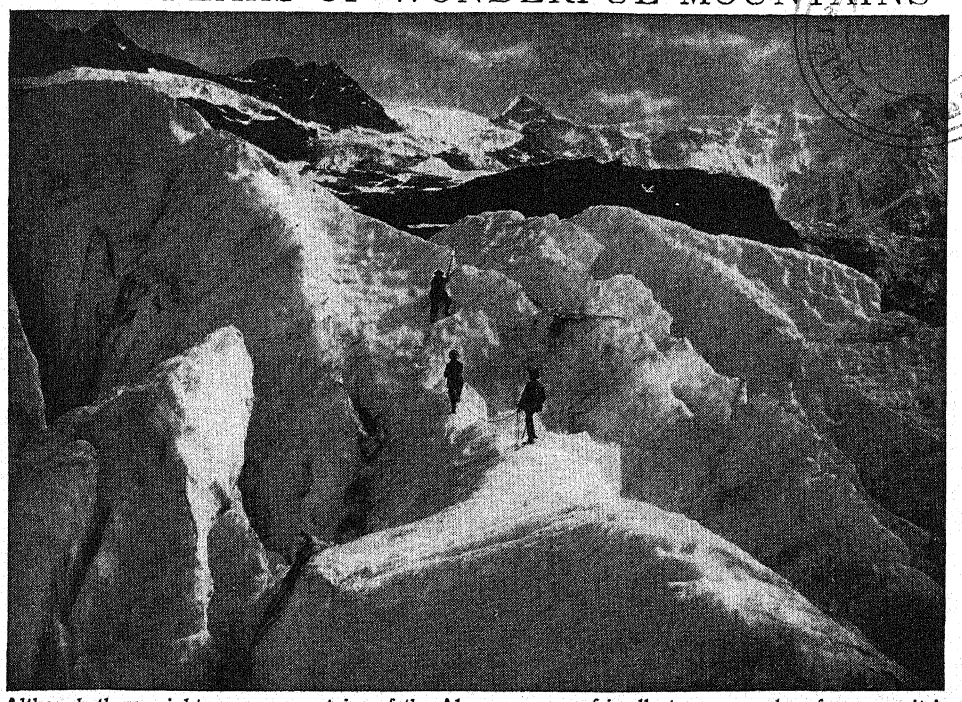
THE SWISS REFORMERS AND THEIR ENGLISH FRIENDS

Switzerland had its own Reformation about the beginning of the sixteenth century. Large numbers of the people listened to the teaching of the reformer Zwingli and others, and left the Church of Rome. Unhappily, bitter feelings between the Roman Catholic and the Protestant cantons followed, and there were long civil wars before religious freedom was gained.

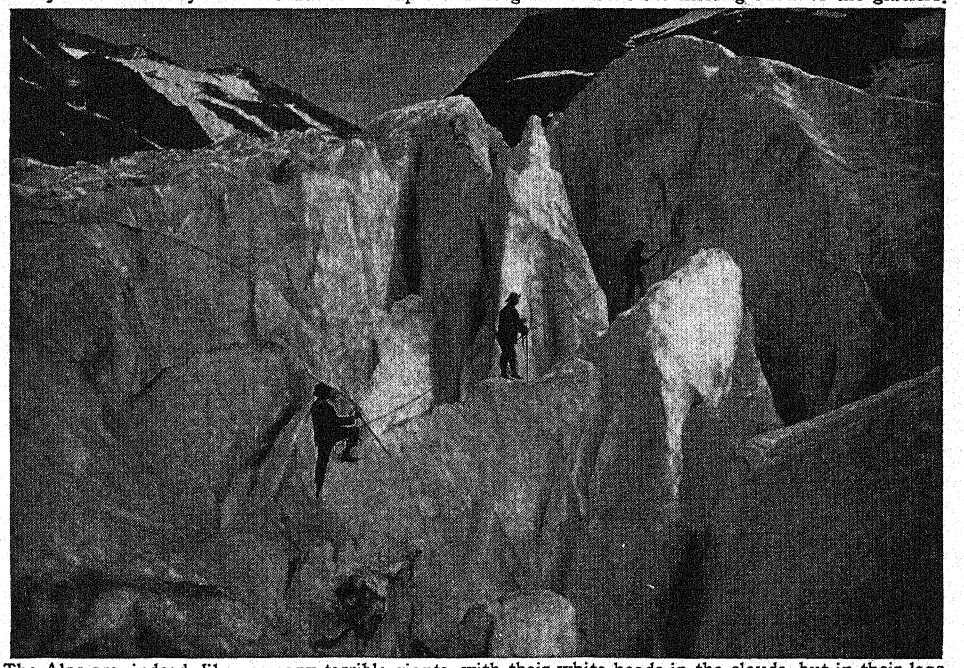
At Zürich are to be seen many letters from eminent persons of Reformation times, which show how much intercourse and friendship there was between the English and Swiss. Especially interesting to children are those of Lady Jane Grey, when a studious girl of fourteen, to one of the Swiss divines. She translated part of one of his books into Greek, for a Christmas present to her father, and asks his advice about the study of Hebrew. At the last sad moment in the Tower, when at the block itself, the poor girl took off her gloves and asked that they should be sent to her Swiss friends. Letters from Queen Elizabeth, too, are amongst those at Zürich, encouraging the Swiss cantons and cities in their struggle for liberty.

Switzerland shared in the progress of those times when people began to care for study and art. The little country

HIGH PEAKS OF WONDERFUL MOUNTAINS

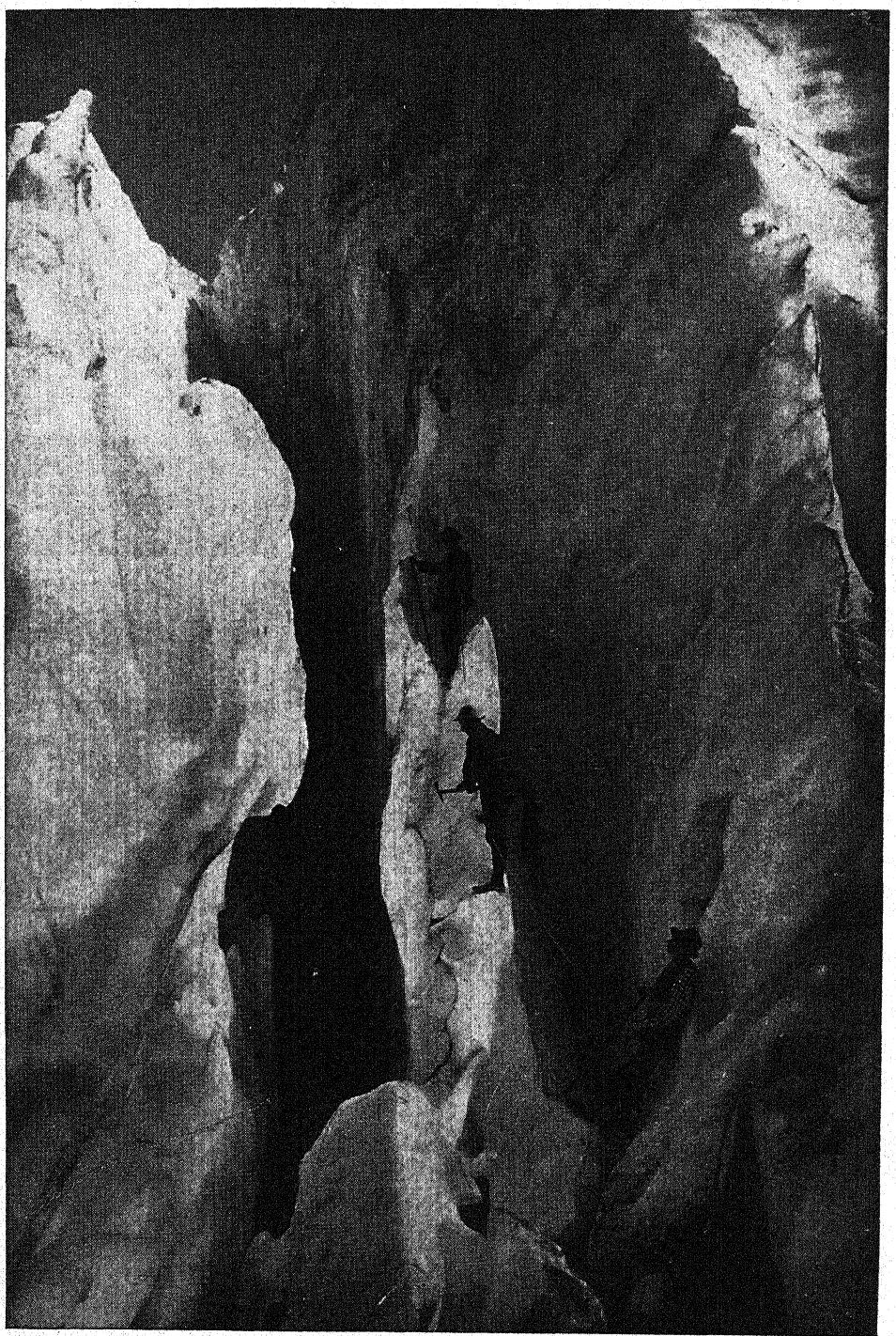


Although these mighty snow mountains of the Alps seem so unfriendly to man, and so far away, it is only the tops of them that are uninhabitable. For lower down their vast and tree-covered sides there are many villages, and in the cosy valleys between the foot-hills of the Alps there are bright and happy towns, merry with the noisy waters that run in rapid tumbling rivers from the melting snow of the glaciers.



The Alps are, indeed, like so many terrible giants, with their white heads in the clouds, but in their laps they let men build their towns and live in peace, though now and then they let slip the dreaded avalanches, which may sweep away a village that has built itself too near the white heads of these giant mountains. It is wonderful to think that an African army, with thousands of horses and elephants, led by the great Hannibal, crossed these mighty Alps more than 2,000 years ago. Napoleon also took an army over the Alps.

CROSSING A CREVICE IN THE ALPS



There are not many heights in the world to which daring men will not climb, and this picture shows us the dangerous things that mountain climbers do. The men are roped together, and, on their way up the Alps, are gazing into the vast depths of a crack in the mountain-side which they are about to cross. Sheer above them rise the snow-clad sides of a great white mountain, the top of which they hope to reach. Many men lose their lives in climbing to these immense heights and crossing over these great depths.

The photographs on these pages are by G. P. Abraham, Keswick.

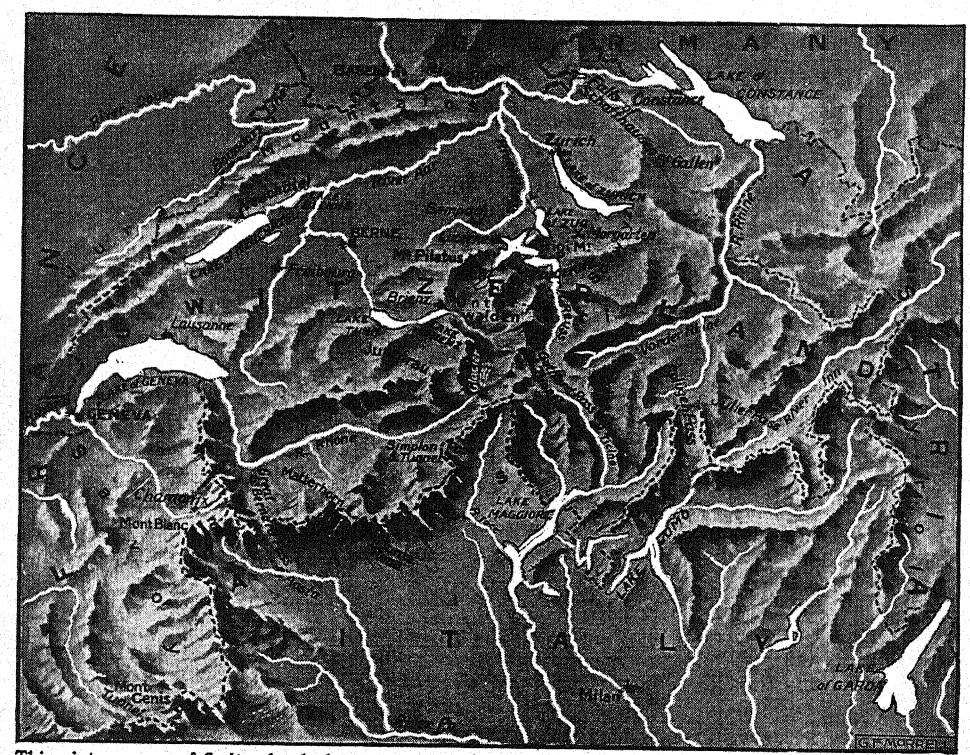
has reason to be proud of its writers and scholars, and the artists who have left such beautiful work behind for later times in the stained glass, wonderful carvings, and painted tiles still to be seen. Refugees from religious persecution in other countries did much to foster trade and industries, especially the weaving of linen and silk. But, despite all this prosperity, a time of decline set in, owing to various causes.

The deeds of daring and courage which led to the rise of the Swiss people spread their military fame over Europe, and Swiss soldiers were eagerly sought after, and hired for pay to fight in other armies, especially in France. This was bad for the independent nation.

Again, the influence of the despotic Louis XIV. spread over Switzerland as it did over Germany, and the spirit of absolute rule led to the peasants being ground down and deprived of their rights, while the governing classes indulged in luxury. There were many grievous risings, and the country was in a sad plight when the cry of the French Revolution, "Liberty, Equality, Brotherhood," spread, echoing over the plain of Switzerland. Hopes ran high for a nobler and happier lot, which were not realized for a while.

When Napoleon turned the whole of Europe about as he chose, Switzerland could not escape, French armies—often fiercely resisted—passed through the cities, across the plain, over the snowy mountains at will. Napoleon made great roads—that over the Simplon Pass is a wonder of the world—as Cæsar had done centuries before, and seized Swiss money and treasures. Then Napoleon turned the country into the Helvetic Republic, under his own eye. The Swiss naturally hated the pounding of the cantons into one state, and the old spirit of bravery and resistance flashed out again and again.

But it was not till after the Battle of Nations at Leipzig that the weight of Napoleon's hand was removed, and the Swiss were far from satisfied with the arrangements made at the Congress of Vienna. Many changes had to be lived



This picture-map of Switzerland shows us, at a glance, what the country is like. We see it as though looking down from a lofty airship. All over the country rise the great mountain peaks, and in between are the beautiful lakes and winding rivers. Other pictures of Switzerland are given on pages 2528 to 2532.

through in the years of the nineteenth century before the twenty-two cantons as we see them to-day settled down to a federal union, perhaps the freest and most representative in the world.

How Swiss Children are Taught to be Clever Workers and Good Citizens

The Swiss believe that "education alone makes free," and their arrangements for teaching are such that they reach to the poorest child in the most remote valley, thus fitting all to take part in the universal voting by which the country is governed. Pestalozzi was one of the great leaders in improving education, and his influence has spread far beyond Switzerland. Great attention is given also to teaching trades of all kinds, and since the introduction of machinery Swiss industries have increased marvelously, in spite of want of coal and of a sea-coast. The water power in the leaping torrents from the mountains is turned to use in saw-mills and other factories, and early last century in the cloisters of the famous St. Gall Monastery arose the hum of spinning, and in Zürich and the neighborhood the cotton and embroidery manufactures now so famous all over the world began. The production of silk goods holds its own at Zürich and Basel, and at Neuchâtel and Geneva are made watches and musical boxes.

All round the borders of Switzerland, the trains now bring in the coal and raw materials needed by the industrious country, and carry away its finished work. Switzerland has also to obtain from abroad much grain, as well as coffee, rice, eggs, and other foods.

Railways that Run under the Mountains and above the Clouds

The lines that pass on into Italy depend on the wonderful tunnels that have been made through the masses of the Alps. We read on page 2416 of the Mont Cenis Tunnel in the French Alps. The St. Gothard Tunnel is a little longer, and the Simplon Tunnel is twelve and a quarter miles long. The engineering of all these Alpine railways is most wonderful, not only in the tunnels, where workmen starting from the two ends met in the middle of the mountain, but also in the loop railways, and the numberless mountain lines that climb over passes, and up steep inclines to heights that are often above the clouds.

It is the tourists, the visitors "come out to play," who use these lines chiefly; by the railways they can reach places hitherto almost inaccessible, and enjoy the fine air and the magnificent walks and views, and can climb higher up if they have the strength.

It is delightful, too, to get a peep into the life of the mountain folk, to see them taking charge of the great herds of brown and cream cows, with their tinkling bells; making cheese in the little huts; carrying down an immense weight of them to sell in the markets below. It is touching to notice how every little scrap of land is made the most of, and how the tiny crops of hay are collected in a net, and carried to the loft to be stored for winter use. For, as the cold and snow come on, the cattle are driven down from the heights, and there is much lowing and jingling of bells as they make their way to the valleys.

How the National Cross of Switzerland became the Symbol of Mercy

A large trade in condensed milk is carried on in Switzerland, and the milk of Swiss cows is also used in chocolate-making. Swiss chocolate is particularly good. In the winter many of the mountaineers carve little animals, chiefly bears, like those to be seen in the pit at Berne, and little chalets such as they live in themselves, with stones on the roof, to keep it on in the stormy winds. They are also very clever in making flowers and other delicate things out of ivory. All these things and many made in factories, too, render the shops very tempting wherever tourists gather, especially in Berne, and Zürich, the largest town in Switzerland, Lucerne, and Geneva. It was in Geneva that a great meeting was held to arrange matters between the nations so as to try to lessen the horrors of war. It was then declared that nurses, and doctors, and ambulances must never be fired upon. In honor of Switzerland, its flag, with colors reversed, was taken as a badge of safety, and the familiar red cross reminds us constantly of the Swiss flag of freedom—a white cross on a red ground.

Since the Congress of Vienna, Switzerland has been a neutral or peace country. In war time she sides with no one, and only trains her sons to be ready to defend homes and dear ones if need be.

THE NEXT STORY OF COUNTRIES IS ON 3073.

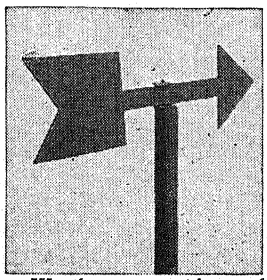


HOW TO STUDY THE WEATHER

CONTINUED FROM 2875

WHEN we think of the changes in the weather day by day, it seems a most difficult thing to tell what it is going to be like to-morrow. Yet, in the newspaper every morning, we can read a forecast of what is going to happen during the day, and, although we cannot all have the wonderful instruments with which clever men foretell the weather, it is possible to construct a few devices with very little trouble.

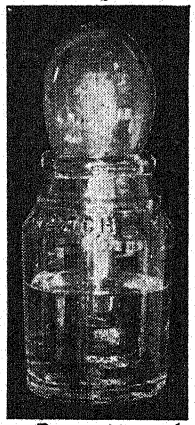
In order to find out the kind of weather which is coming, it is necessary to discover whether the air around us is damp or dry. If there should be a great deal of moisture in the atmosphere, clouds, made of countless particles of moisture, are readily formed, and rain is likely to result. A piece of ordinary brown seaweed, hung up on the wall of a room, will tell us whether the air is damp or dry. When there is little moisture about, the weed will be crisp and hard, but directly rain is coming it will be damp and flabby.



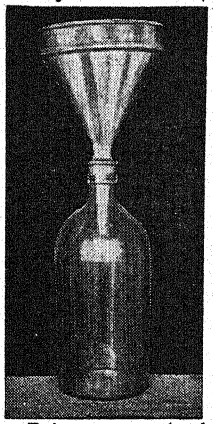
1. Weather-vane cut in wood

Another important matter is the weight of the atmosphere. Over every object in the world there is a great column of atmosphere, so to speak, miles in height. We get so used to the pressure that we do not notice it, but it is there all the same.

Now, the weight of air varies from time to time, because when the atmosphere is very moist it is lighter, while when dry it is heavier. On this account it is very necessary that we should know the changes in the pressure of the air. The barometer is an expensive instrument; but, with a glass jar and an oil-flask, we may make a device which will tell us a good deal about the weight of the air. Fill the jar about half full with water. Now place the empty oil-flask neck downwards into the water in the jar, as seen in picture 2. The water will rise up some distance in the flask. From day to day the height of the water will vary, and, indeed, it will be responding to the pressure of the atmosphere on the water in the jar, so that when the air is dry, and therefore heavier than usual, the water will be higher than when the atmosphere is moist and light. Thus we may expect fine weather when the water in the flask is high, and storms when it is low.



2. Barometer made of jar and oil-flask.



3. Rain-gauge made of a bottle and a funnel.

Animals are very sensitive to weather conditions. When it is likely to keep fine, leeches will remain quietly in the bottom of a jar, while at the approach of a storm they will become very restless. A frog in an aquarium keeps to the bottom of the water if the weather is going to be stormy, while in fine weather he will enjoy coming to the surface.

It is always interesting to know which way the wind is blowing. In some parts of the United States, when the wind blows one way, it will not keep fine for very long, and wind from the opposite direction means dry weather. It is easy to cut out a weather-vane, in the shape of an arrow, from a piece of flat wood, as seen in picture 1. If

you drive a nail exactly through the centre of the shaft, the vane may be fastened on to a broomstick, and the pole then fixed in an open place, such as the top of a summer-house, or from the upright branch of a tree. By watching the movements of the sun, or by using a small compass, we can readily find out which is the east, and the west, and so on.

It is easy, also, to keep a record of the rainfall. With a narrow-necked bottle, holding about a quart, and a funnel with an opening the same size as the bottom of the bottle, we can make a very simple rain-gauge. The end of the funnel is put into the neck of the bottle, and the whole thing left to stand in the open, perhaps on a lawn. The rain-gauge must be left out night and day, of course, and at the end of twenty-four hours you must look and see whether any rain has fallen or not—of course, emptying the bottle each time. The bottle used should be one with a flat bottom, and not one with a raised bottom inside. If, after a storm, there is an inch of rain in the bottle, that is the depth of rain that has fallen.

But it may not, perhaps, be easy for you to get a bottle and a funnel exactly the same width, and in that case it will be more difficult for you to measure the rainfall. It would seem that if we use a funnel 12 inches wide, catching the rain falling over a width of 12 inches of space, and then measure its depth in a bottle 6 inches wide, the depth in the bottle ought to be twice the real depth of the rainfall. If you will think for a moment you will see why this is not true. Think of your bottle and funnel as square and you will see that the area of the mouth of the funnel is four times as great as that of the bottle. It is very easy to find the area of a circle if you will only remember one little rule which you can find in your arithmetic. It took wise men a long time to find it out. Here is a rule regarding areas which at first sight you may think a little difficult, but which is quite easy. It is :

Area = square of diameter + 0.7854.

This means that to find the square inches within a circle we must multiply the diameter of the circle in inches by itself, and multiply the result by 0.7854. Now, suppose that the bottle is 3 inches in diameter inside. We multiply 3 by 3, giving us 9, and then we multiply 9 by 0.7854, and the result is 7.0686. The fraction is so small that for our purpose we may disregard it, and say that the area of the surface of the water in the bottle, or of the bottom of the bottle, is 7 inches. Now, let us suppose that the measurement across the mouth of the funnel is 8 inches. We multiply 8 by 8, giving us 64, which we again multiply by 0.7854, and get for answer 50.2656. This is just a very little more than 50 square inches, and we may count it as 50 square inches.

Now, if the amount of rain water which has fallen in the bottle measures 1 inch in depth, we have to find what it would be in a bottle of the same diameter as the mouth of the funnel. To do this, we multiply 1 inch by 7, and divide it by 50. This gives us almost one-seventh, so we say that a seventh of an inch of rain has fallen. Whatever the diameter of the bottle and of the mouth of the funnel may be, we can find the amount of rain by following these rules, and if we know the size of a garden or of a field, or even of a county, we can tell, by working it out, what *weight* of water has fallen over the whole area. The rule to work upon is that $27\frac{3}{4}$ cubic inches of water weigh one pound.

A CLEVER AND AMUSING WORD GAME

THE game of doublets is an interesting word game that gives plenty of scope for skill and ingenuity, and enables us to exercise our memories and to make good use of our knowledge of words. Two words are chosen, each containing the same number of letters, and the words should be either of quite opposite meaning, as wrong and right, black and white, good and evil, rise and fall, and so on, or they should stand for things quite different from one another, as wood and iron, butter and cheese, soap and grease.

The game is to change one word into the other by changing only one letter at a time, and making a chain of words between the doublets. Two or three examples will make the method clear.

black	tame	beef	cat	black
slack	time	been	cot	block
stack	tile	bean	dot	clock
stalk	wile	beak	dog	click
stale	wild	peak	more	chick
shale	shoe	perk	lore	chink
whale	shot	pork	lose	chine
while	soot		loss	whine
white	boot		less	white

It will be seen by these examples that only one letter is altered in each word to make the next, and every change makes an actual dictionary word. It is not allowable to make a change of a letter that will produce something that is not a real word. For instance, we might have changed beef into pork like this: beef, boef, bock, boek, bork, pork. That, of course, would be wrong, as no such words as boef, boek, bork, exist.

Then the transformation from one word to the other must be made with as few changes as possible. In changing from black to white we might have proceeded like this: black, block, clock, click, chick, thick, think, thine, whine, white; but here we make eight words in between, and not more than seven are needed.

It must, of course, be understood that in changing one letter to make a new word in the chain, the substituted letter must occupy exactly the same position in the new word that the discarded letter did in the old word. Thus we can change bean into bran, but not into barn, for e being the second letter in bean, r must be the second letter in the new word, as it is in bran.

A LITTLE VEGETABLE GARDEN

WHAT TO SOW AT THE END OF MARCH

DELIGHTFUL as it is to have gay, sweet-smelling flowers in our garden, many of us are perhaps quite as much interested in growing vegetables.

March is one of the most important months of the year as regards vegetables. Think of it; all the vegetable seeds are waiting to be sown, and in many cases the early-sown seed produces the best crops, although there are certain tender subjects that must not be sown out of doors during this month; the scarlet runner beans, beet, limas, and dwarf French beans must wait for some time yet.

What shall we sow in March? Peas, tomatoes, Brussels sprouts, cabbages, cauliflowers, onions, lettuces, leeks, and radishes, some may with advantage be sown during the month, and if we like we may make two or three sowings of each by sowing part of the packet now and the remaining part a fortnight or three weeks later. This should certainly be done in the case of lettuces, radishes, and cress, or we shall have our whole crop ready to be eaten all at once.

One of the most important things to remember is that it is essential that seeds be sown very thinly, especially if we mean to grow strong, fine crops. It is easy to understand this; if a little plot of ground has food and nourishment enough to grow one hundred plants, it stands to reason that, if it has to divide this among three or four times that number, the little things will be partly starved.

It is a capital plan to mix a little dry sand or soil with the seed, and then to sow soil and seed together; this is especially to be recommended when we are dealing with *small* seed, for, of course, it would be quite unnecessary to mix sand or soil with peas or beans, or other large seeds. The exception to thin sowing is cress seed; that is always sown quite thickly.

A thing to be really proud of is to be able to grow a fine crop of onions; any child who does this has accomplished a feat of which he or she has a right to be proud. They are by no means difficult to grow, and they are the most interesting of all garden crops. Let us consider them a few minutes. They are different from most of the vegetables we eat. They are bulbous plants, and, if we think of it, they make their bulb very quickly; much quicker do they come to full growth than most plants of this same nature. Then, too, there is something pretty and attractive and full of character in the appearance of those straight, tube-like green tops growing in a narrow bed, narrow to enable us to reach half over from one side, and the other half from the other, so that, when weeding or thinning out the little plants where they are growing too thickly, we do not tread more than can be helped on the actual bed.

Before the seed is sown, the ground should be deeply dug and manured if necessary. But onions like a firm bottom, so that the bed should be well *trodden* all over before the seed is sown, and the surface made ready to receive the seed by being lightly raked over. Mix the seed with a little sand, for it is important to sow very thinly, and make drills across the bed to receive it; these drills may be made with a thick stick, but the best thing is to fix three pegs in an old wooden rake, out of which the teeth have disappeared. The drills should be nine inches apart, and the seed may be covered with a quarter of an inch of soil; this may be done by raking back the little ridges that were thrown up when the drills were made. Finally, when the seed is in the ground and covered, the surface soil can be made firm with the back of a spade.

Onions like to grow in good, rich soil, and the manure should have been applied before this. They also like a position that is not shaded by overhanging trees, as they must get plenty of warmth and sunlight.

Sow the peas thinly; many people sow them in trenches four inches deep, as they withstand a dry time during summer better than on the level, and the rainfall, or water otherwise given, is of greater benefit, but the ground should be dug for a considerable width and the trench made afterwards.

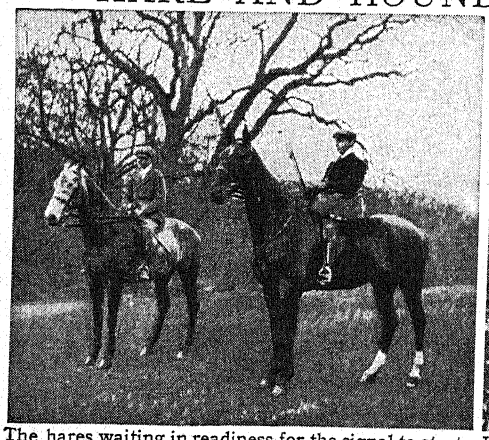
Potatoes, carrots, parsnips and oyster-plants may also be planted at the end of the month, or earlier in the southern parts of the country. But the tomatoes, cabbages and cauliflowers are started in the house, in shallow boxes, and are carefully tended and transplanted until the weather is sufficiently warm. Six weeks later we may set out the little plants. Lettuces are best started in this way also, or in cold frames.

A GOOD GAME TO PLAY ON A TRAIN

HERE is an interesting game to play when we are traveling. While the train is standing in the station all the players look about, and take as much notice of things as possible. Then, when the train has left the station, and five minutes have elapsed, we take it in turns to name any object that we saw at the station. Of course at first this is very easy, and we can go round and round again, each player naming one object which no other player has mentioned. But at the game goes on, it becomes harder and harder to think. The one who is last able to mention an object wins the game.

THE NEXT VEGETABLE GARDEN IS ON PAGE 3217.

HARE AND HOUNDS ON HORSEBACK



The hares waiting in readiness for the signal to start.



Hares laying the trail of paper up a woodland path.



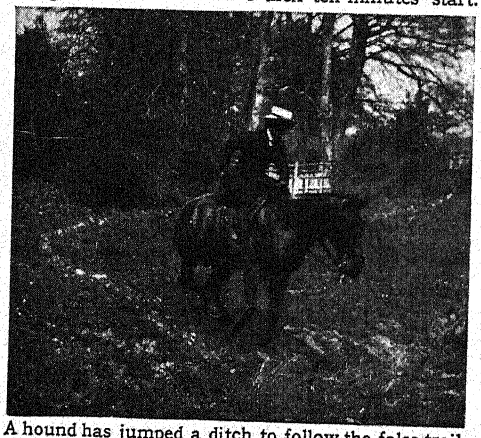




Some of the hounds, mounted ready for the chase, waiting while the hares have their ten minutes' start.



Here the hares are laying a false trail through a gate.



A hound has jumped a ditch to follow the false trail.

A PAPER-CHASE on horseback is a common amusement for a holiday in England during the hunting season, and these pictures show us some of the most interesting incidents in a successful run across country by boys and girls of from six to sixteen years of age.

All who possess a mount of any sort, from a hunter to a Shetland pony, or even a donkey, may join in the game, which is a very similar one to the paper-chase run on foot.

The two hares carry big satchels crammed with white paper, torn up into little pieces, and for a mounted paper-chase the trail must be laid as thickly as possible, in order that the hounds may be able to see and follow it at a good pace. The hares are given ten minutes start, to allow them time to lay a few false trails. The course should be about six miles long, and should be

A HOLIDAY SPORT FOR THE COUNTRY

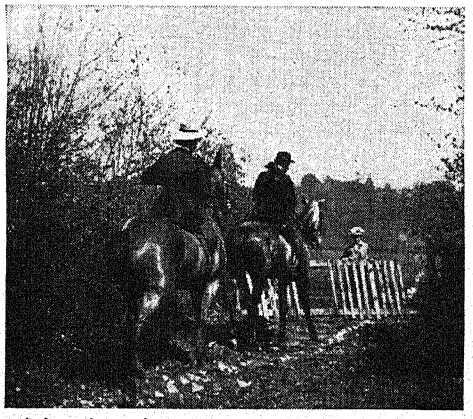


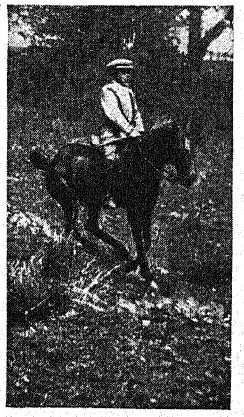
Hounds following the trail across a shallow stream.



Following the trail in and out of a thicket of bushes.

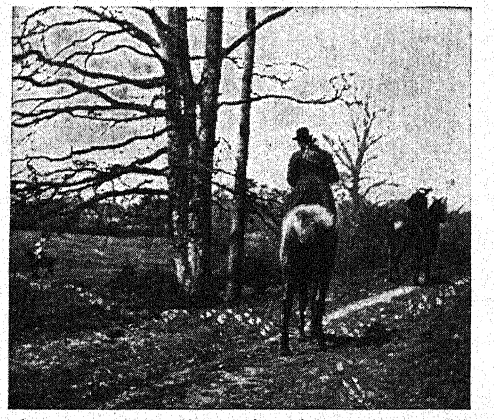






Here we see some of the hounds jumping a fence, passing through a gate, and leaping a ditch in hot pursuit.





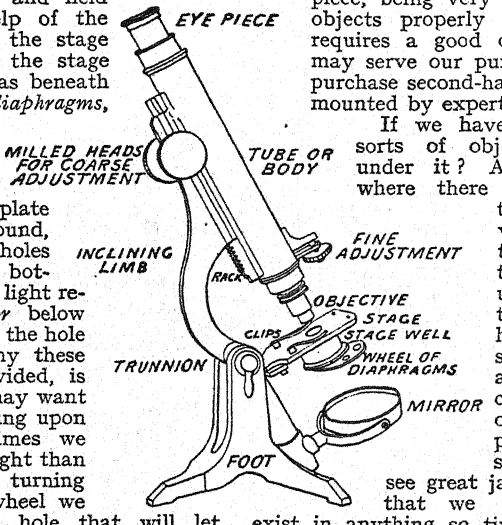
In these two pictures the hounds are puzzled, for they have come upon places where false trails are laid.

free from dangerous ditches, although low jumps across narrow ditches or over obstacles which can be moved aside to allow the smaller children to pass through, if necessary, add greatly to the excitement and fun. The course should be as varied as possible, and if there are woods a good trail can be laid in and out of the trees for a little way; then a long straight run down a ride, along which the hounds can get a good gallop, while a shallow, pebbly bottomed stream to cross makes a specially good feature, and it is rather amusing to lay a part of the trail near the finish in a big sweeping half-circle, for even if the hares are spied by the hounds far ahead, or a few yards to one side, they must be followed by the trail, for no short cuts are allowed.

THE WAY TO USE A MICROSCOPE

ON page 2331 of this book we read an account of the strange things that we may discover for ourselves by the use of a microscope, that wonderful instrument that opens for us so many obscure pages in Nature's book. We learn there what a microscope is, and we see in the pictures some of the things that a microscope can reveal. Here we shall see how to use the instrument.

In the middle of this page there is a diagram picture of a microscope, and by studying this picture we can see the purpose of the different parts of the microscope. The *tube* or *body* is the long, round portion that is really explained by its name. The *eye piece* is at the top end of the body, and at the other or lower end of the body is the *objective*, or the magnifying glass nearest to the object to be examined. The object is placed upon a *stage*; usually the object is mounted upon a small glass slide or between two small pieces of glass, which are then placed upon the stage and held in position by the help of the *spring clips* seen upon the stage in the picture. Under the stage is a *stage well*, which has beneath its lower end a *wheel of diaphragms*, or a *rotating diaphragm plate*, as it is also called. The diaphragm plate has in it a number of holes, and the entire plate or wheel can be turned round, so that any one of the holes desired may be at the bottom of the well, and the light reflected from the *mirror* below is made to shine through the hole in use. The reason why these different holes are provided, is because sometimes we may want to have more light shining upon an object, and sometimes we may want to have less light than at other times. By turning round the diaphragm wheel we can bring into use a hole that will let through just the quantity of light that we want.

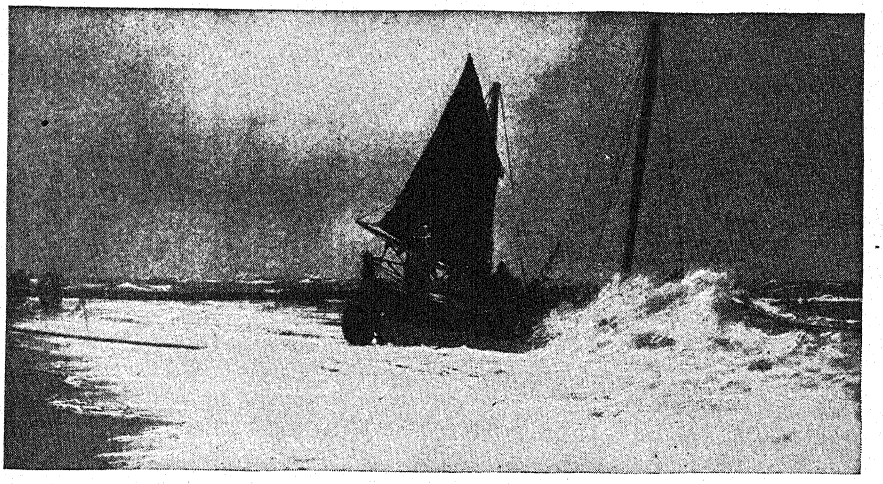


Now let us turn to the frame of the microscope and see how the parts there are named, and learn their use. There is the part marked *foot*, which is really the base with three feet. This supports the body and every other part of the microscope. Next we have the *trunnion*, which is the place where the frame that carries the tube is fixed to the foot or base. The frame swings in the trunnion, and by loosening the screw at the trunnion we can swing the body of the microscope into a more inclined, or into a more erect position. Next we have the *inclining limb*, which rests in the foot at the trunnion, and which has two *milled screw-heads*. By turning these screw-heads we can lengthen and shorten the distance between the eye piece and the object, so as to bring the object we wish to examine into better *focus*, which means to bring it so that the eye can see it plainly, and not merely as a blurred outline. But these screw-heads which work the body up and down in the *rack* do not provide a fine enough adjustment to be quite right. Therefore there is, right in front of the body, a *fine adjustment screw*, which makes it possible to get exact adjustment so as to render the object under examination quite distinct, so that we can see clearly the hair on a fly's wing, or the little swimming things that live and fight in a drop of stagnant water.

Having seen the use of the different parts of a microscope, we may now learn something about the objects that we may desire to see magnified. Not many objects can be seen properly without some preparation and suitable mounting. The usual way to mount the objects is to put them between two small pieces of glass, cut to a suitable shape, the lower piece of glass being of ordinary thickness, and the upper piece, called the cover piece, being very thin. But to mount objects properly in microscope slides requires a good deal of skill, and it may serve our purpose much better to purchase second-hand specimens already mounted by experts.

If we have a microscope, what sorts of objects should we put under it? All around us everywhere there are countless things that will make us marvel as we see them with the sharper eyes that the microscope can lend us. We can go into the garden, or into the hedgerows, and collect some insects, including a spider. The insects can be killed with a drop of chloroform, and then put upon the microscope stage. We shall see great jaws, feet, claws, eyes, that we never suspected to exist in anything so tiny. The spiders are really terrible. There is scarcely a tool or a weapon made by man that has not been anticipated in the structural form of Nature's tiniest creatures. We find many insects provided with what look like chisels, saws, scissors, and files. If we would see the beautiful colors that Nature gives to some of her creations, we must take the wings of some butterflies and let the light from the microscope mirror strike the glorious scales sideways; then we shall have a picture in color that the most brilliant painter could not equal. Animate and inanimate Nature provide a wealth of material for our wonderment and instruction. Even the golden pollen dust that we rub off the flowers with our fingers is seen under the microscope to be of globular, elliptical, and other shapes, beautifully marked with dottings and ribbings. The pollen of each flower differs from that of all others, and each has its special interest.

THE NEXT THINGS TO MAKE AND THINGS TO DO ARE ON PAGE 3113.



A RACE FOR THE LIFEBOAT

CONTINUED FROM 2816

A LITTLE girl named Margaret, who was born and bred in a fishing village on the Scottish coast, was sleeping alone with her mother one summer night.

While the dark hours wore away, the wind rose, and the waves grew big and tossed their manes as they came dashing to the shore. The mothers and sisters in the fisher cottages woke and started at the sound. They knew that it meant danger to their dear ones away in the fishing-boats. Morning dawned, and they went and stood on the shore straining their eyes in search of sails. While they waited there in trouble and fear, they saw, to their dismay, a ship heaving up and down on the waves, drifting nearer and nearer to the sharp rocks.

The little crowd of women, children, and feeble old men on the beach stretched out their hands helplessly towards the men in the rigging. There was not a boat left on the shore; all the strong men and boys were away fishing, the lifeboat station was four miles away, and there was none among the helpless group who could launch a boat in such a sea. Yet it was heart-breaking to watch men perish before their eyes. "If only the lifeboat men could know!" a woman cried. Little Margaret heard her, and a bright thought came to her. Eagerly she asked if the ship could hold together while she ran for the lifeboat. Someone shouted that she would not be able to cross the stream, but Margaret was off. Four miles, and that flooded burn lay before her! It raged like an animal; its banks were flooded; and, worst of all, the small plank bridge had been carried away.

Into the water Margaret plunged. It nearly carried her off her feet, and she gasped and shuddered as it chilled her through and through. Then rallying all her strength she forced her little body against the current, and inch by inch pressed on. And so the worst was over, and she was out of the stream.

At last the tottering feet of this brave little maid reached the village street, and she had just strength to cry out that there was a ship on the rocks before she lost consciousness. But she had done her work. Kind hands cared for her. Meanwhile the crew of the lifeboat quickly took their places, launched the boat, and hastened to the scene of the wreck.

Margaret's deed was not in vain, for the lifeboat was in time, and rescued the crew of the ship on the rocks.

THE BRAVE MAID OF THE MILL

IN a small village near Bonn, on the Rhine, there is a mill which, on a Sunday long ago, was left in charge of a maid named Hänchen while the miller and his family went to church. The youngest child—a boy of five—being too young to go to church, stayed with Hänchen.

Now, Hänchen was sought in marriage by a man called Botteler. He was a worthless fellow, but Hänchen did not believe the bad tales about him, and on this Sunday morning, when he knocked at the door, she let him in and gave him food. He dropped his knife, and, when the girl stooped to pick it up, gripped her by the neck and threatened to stab her if she did not tell where her master's money was. In a moment she knew his real character; but, instead of yielding to fear, her courage rose while a hundred plans rushed through her brain. She could hardly speak, but managed to make him understand that she would yield to his wish as she had no choice. Then she led the way to the miller's room and the box where he kept his money. Giving him an axe to open the chest, Hänchen said she would hurry upstairs and collect some clothes and her money, for she dared not stay after betraying her employer.

But instead of running away the brave Hänchen returned to her master's room another way and bolted the robber in. Then she ran downstairs and out at the front door to find help. She saw the little boy, and told him to run to meet his father, and say that he must come quickly or something dreadful would happen. The little fellow, young as he was, understood, and ran off at her bidding. Suddenly, however, she heard a whistle, looked up, and saw her prisoner signaling to someone to catch the child. Then, to her horror, as the little fellow ran on, she saw a man spring up from the ground, snatch up the child, and run back to the mill.

Hänchen at once recovered her presence of mind. She must save the child now as well as herself and the house. Her courage rose; her nerves became like iron. She went back hastily into the mill, locked and bolted the door.

Soon the man who had snatched up the child clamored to be let in. He threatened the screaming boy with a knife, and said he would break down the door. But Hänchen trusted in God.

Then the man Botteler called to his accomplice to kill the child. Poor Hänchen shuddered at that; but she reasoned that the child's death could be no gain to them, and rightly judged this to be a mere threat. Then the robber outside threatened to burn the mill, and put down the child to go and carry out his threat. In peering round the mill, he found the big hole where the wheel was; so he returned to bind the child with a piece of rope, and went back to creep into the mill that way.

Meanwhile, Hänchen thought that if she set the sails of the mill in motion the neighbors in the country round would know that something was wrong. She had seen the machinery worked, so she flew to the engine and set it going. Slowly at first, then faster and faster it went, but she little knew that the robber had squeezed himself into the drum-wheel. There he was, whirling round and round, unable to stop the machinery, and there he whirled until he grew giddy and senseless. But though she at last heard his cries, Hänchen did not dare to let him come out of his terrible prison, and she knew he would not be killed. The brave girl waited and waited, till it seemed as though the miller were never coming and that no one had understood her signal of distress.

At last! A loud knocking at the door! There were Hänchen's master and some of the neighbors, who had come to find out why the mill was working. They had found the child bound on the grass, but too frightened to tell what was the matter. Hänchen managed to tell them and then she fainted.

The brave girl had done her duty, and left the rest to the miller and his friends. They secured the two robbers. The one in the mill-drum was recovered, and both were bound and taken to Bonn. There they were punished for their evil deeds. But the miller's eldest son married the brave Hänchen, and she lived all her life in the mill which her wits had saved from destruction.

THE BOLD HERO OF THE MOUNTAINS

ALL countries cherish the name of some patriotic man who has fought for the liberty of his native land. Just as the United States has its Washington, Scotland its Wallace and its Bruce, Italy its Garibaldi, so the Caucasus has its Schamyl, who, for more than a quarter of a century, struggled to keep the wild mountain land of his birth free from Russia's iron grip. He was weakly as a child, but his strength was developed by outdoor games and sports, and he grew up a sturdy youth.

Schamyl was absolutely fearless, and such a youth of his word, that, when he found remonstrance without result in curing his father's drunken habits, his oath to kill his parent if he again transgressed brought the father to his senses, and to the end of his life he abstained altogether from alcohol, knowing that Schamyl would carry out his threat.

When Schamyl was twenty-six years old, in 1824, he began his long fight against the Russian generals who were sent to subdue the land. He was a born leader, courageous in attack, skilled as a strategist, and clever in retreat. Many stories are told of his hairbreadth escapes from the Russians. Once his little band was surrounded by their enemies. If they could not fight their way through the bayonets of the Russians, they must either starve or be cut to pieces, for they knew not the word "surrender." Schamyl, who was ever the foremost and the boldest in attack, galloped alone through the enemy's lines, and reached in safety his mountain fastnesses, as we see in the picture. He was the only one to escape with his life, and his pious Mohammedan countrymen believed the angel Gabriel specially protected him. During another fight Schamyl killed three Russians, but was himself pierced through by a bayonet. Yet he slew his assailant, and got away as by a miracle. He was then chosen chieftain and ruler of the Eastern Caucasus by his compatriots. Little wonder that his people rallied to him as to a prophet who was born to deliver their country.

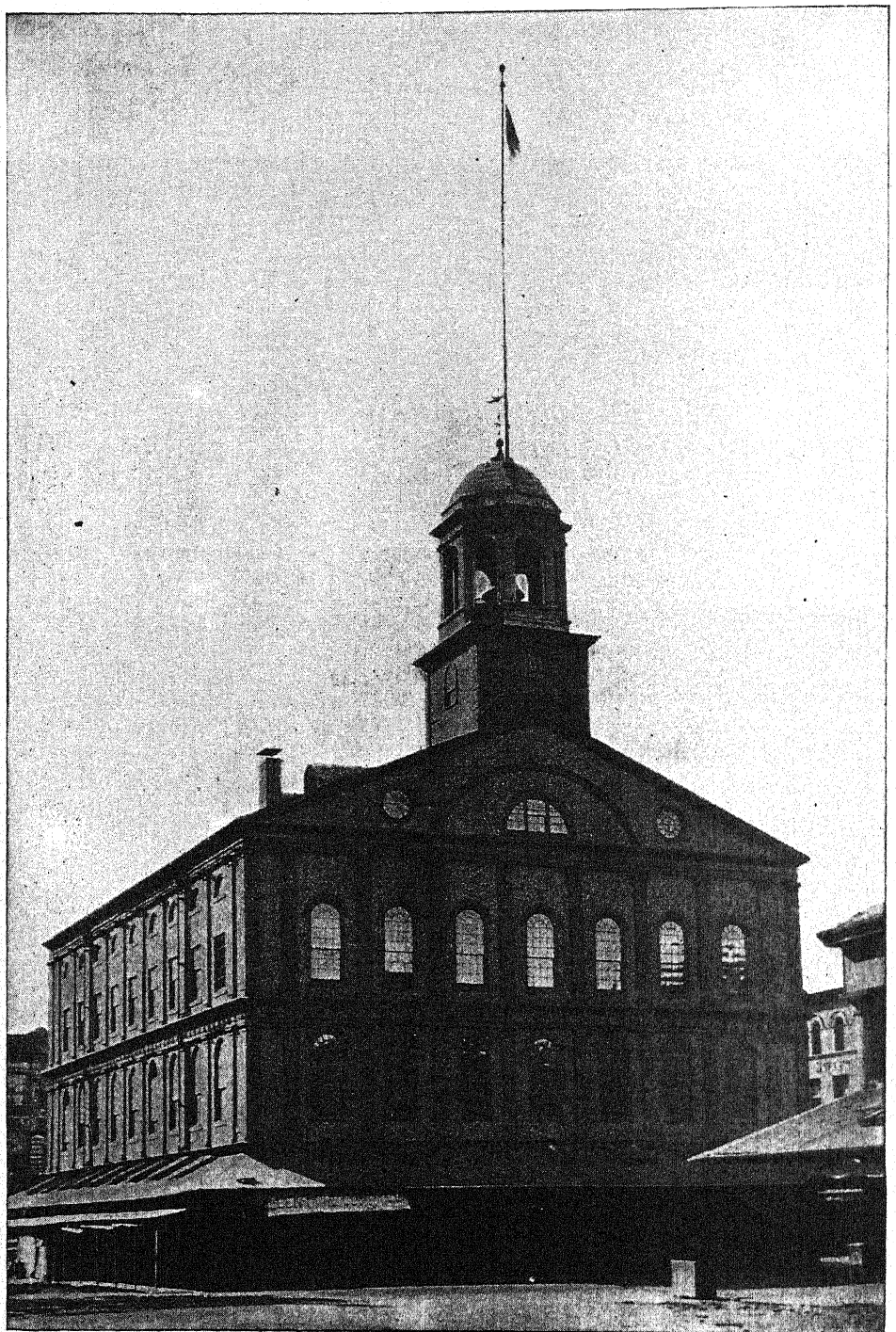
A mountain fortress long held by Schamyl was at last captured by the pick of the Russian troops, and again he was the only man to escape. It is said that he let himself down the steep rock by a rope to the river below, boarded a raft, and thus got away. Many generals were sent against Schamyl, but he eluded them all, and time after time rallied his countrymen to his standard. One general died through shame at being conquered by such a small band of mountaineers. Russia's attention was for a time diverted by the Crimean War; but that over, new efforts were made to overcome Schamyl and his brave countrymen. The end was inevitable, for Russia's resources were enormous compared with Schamyl's. The latter took refuge in a little fortress on a hill in Daghestan, and there, when all except forty-seven of his men were killed, seeing that, even if he did escape, there were no longer any patriots to rally, he submitted.

Schamyl was not a wild brigand, but a wealthy man of culture and high character, who ruled with justice and ability, was merciful to the Russian prisoners, and fought for love of his country during many long weary years.

THE NEXT GOLDEN DEEDS ARE ON PAGE 3069.



THE CRADLE OF AMERICAN LIBERTY



Faneuil Hall, one of the most famous buildings in America, was built by Peter Faneuil, a merchant of Boston, and presented to the town, in 1742. It has been twice rebuilt, and is still used for its original purposes, that is, a market and a meeting-place. Before the American Revolution, it was the scene of many meetings which planned resistance to Great Britain, and as a result gained the title used above.

WHAT THIS STORY TELLS US

THE navy of the United States has always been noted for deeds of daring, and boys, and girls, too, can find many heroes among the brave commanders, from Paul Jones down to the present day. In the early days the ships were of wood and some were very small, but their commanders fought them as if they could not be harmed by the guns of their opponents. Every American heart is thrilled by the story of "Old Ironsides," a ship that could not be beaten. Perry's victory on Lake Erie has fired the heart of many a boy and helped him to be brave and modest, too. Jones, Perry, Lawrence, Bainbridge, Decatur, Preble, Hull, Macdonough and all the rest will never be forgotten while love of country burns in the hearts of our boys.

NAVAL HEROES OF YOUNG AMERICA

CONTINUED FROM 2942



WHEN war broke out between the colonies and the mother country, England was mistress of the seas. Her ships went everywhere and her colonies could send their merchantmen into any port open to them under England's protection. But when they were at war with her, all this was changed. The colonies had to fight their own battles and look after their own ships at sea. The colonists owned many trading ships, but they had never had any reason to build ships of war for protection.

They had little difficulty to gather together a crude army. Soldiers were in the field at a moment's notice. But to get a navy able to fight the English men-of-war was not such an easy matter. It took a long time to build ships for warfaring and the expense of fitting out vessels for action was great—greater than the colonies could then afford. So when troubles between the countries began, the colonists had not a single ship large and strong enough to meet any one of the British fleet.

PRIVATEERS A SUBSTITUTE FOR WAR VESSELS

But there was a crying need for naval protection of some kind. Coast towns were open to attack by the enemy, and ships carrying American troops and supplies must go unharmed from one place to another. It was a trying situation for the struggling colonists but they planned to make the best of it. So they allowed hundreds of small boats to be fitted out as privateers by private persons. These boats by attacking English merchantmen made it necessary for the British fleet to guard them; and the more war-ships were used in this way, the less they could be used to attack American commerce. The privateers helped the colonists somewhat, for commerce could be carried on after a fashion, though with some risk.

But after all, this was but a makeshift of a navy. Something better was soon needed and the colonists could close their eyes to the fact no longer. The first session of the Continental Congress had said nothing about ships, but by the time the second session met the situation was felt as serious and a Marine or Naval Commission was appointed "to consider, inquire and report with respect to the organization of a naval force."

PAUL JONES, THE SCOTCHMAN, OUR FIRST GREAT SEAMAN

Fortunately for the colonists, there was one man among them, a Virginia planter, whose early life as an English seaman made him able to advise them about the kind of ships that would give the best service in the war. This man was John Paul Jones. The Commission invited him to come to the meeting, and he went.

They met at Philadelphia. Paul Jones gave them excellent advice as to

Copyright, 1911, 1918, by The Grolier Society.

the choice of ships and men for the navy. He showed them that they could not hope to fight for the mastery of the seas with England. Only three nations had had fleets strong enough to do that, and these fleets had been the growth of centuries.

The colonists' vessels should not be too large or too small. What was most needed was frigates, rating from thirty-two to thirty-six guns. He thought a squadron of four, five or six of such ships should be constantly kept in British waters and do the kind of sea warfaring that harasses the enemy most. Last of all, one sharp encounter, with the prize taken into some French port, would attract the attention of all Europe and raise the colonists in their eyes more than any battle on land would do. Congress took the suggestion and on December 13, 1775, ordered thirteen frigates built.

THE SMALL BEGINNING OF A GREAT NAVY

While at Philadelphia, the Commission asked Paul Jones' judgment about some ships which Congress had an opportunity to buy. There were about twenty of all sorts and sizes, and they lay moored a short distance from the wharf. He found four fit for service, two ships, the Alfred and the Columbus, and two brigs, the Andrea Doria and the Cabot. Congress bought them, and these four merchantmen, made useful as war-ships, formed the foundation of our American navy. Esek Hopkins, now almost forgotten, was made commander in chief.

Paul Jones accepted a commission in the navy, and in the Alfred, and in the Providence, did some brilliant work in a cruise along the coast and captured sixteen merchantmen. One more splendid cruise along the coasts and Paul Jones left American shores to carry the glory of American seamen into British waters.

THE ENGLISH CALL JOHN PAUL JONES A PIRATE

He attacked the forts at Whitehaven first, then landed on the Scottish shore, and alarmed the people wherever he went. The British were exasperated at the daring of this man, whom they insisted upon calling a pirate. There is no telling what harm he would have done to the enemy if his plan to go right around the British Isles had not been changed. While crossing the Irish Channel, however, he met the British sloop of war, the Drake. After some sharp fighting he captured her and brought her with great pride into a French port. She was a vessel of greater force than the American boat and when the prize was brought in the Frenchmen could scarcely believe their own eyes.

This was not enough. He still had in mind an expedition that would give him the longed for chance for one good sharp encounter with the enemy. That would make a lasting impression. The Drake was only a small boat, as was the Ranger. His victory had amazed France, but he meant the next time to startle the world.

THE FRENCH KING PRESENTS HIM WITH A SHIP

With this object in view, he did all in his power to gather together a squadron of ships. France could give him little help, as she was at war with England and needed all her boats for service. Benjamin Franklin, who represented the United States in France at that time, did what he could to help. But there was little money at his disposal and Congress could not spend any more then for ships. As a last resort, he appealed to the king. Louis XVI, in spite of his own pressing need of boats, gave him a large vessel. She was the Duras, an old merchantman. He immediately changed her name to the Bon Homme Richard, in honor of his friend, Benjamin Franklin. Within three months from the time she was given to him, he had a squadron of five ships ready, and was off to sea.

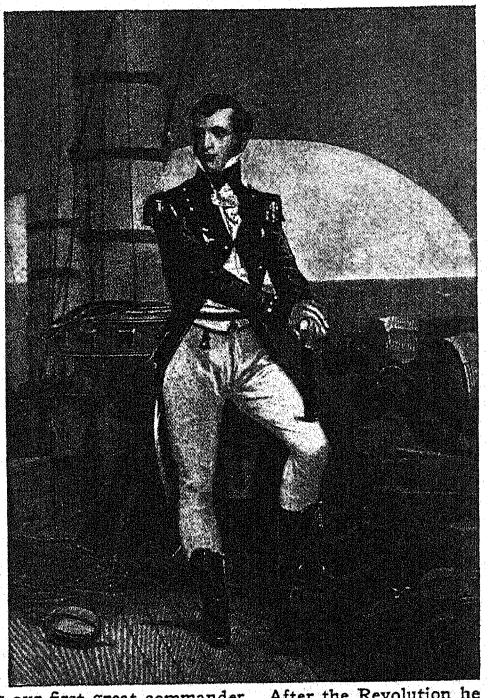
They spent the summer cruising about the British coast, and this contemptible little squadron, as one Englishman called it, did much more to alarm and annoy the people than the whole French navy had been able to do. One morning a British fleet of forty sail was sighted off Flamborough Head. They were merchantmen bound for Scarborough Head under protection of two men-of-war, the Serapis, Captain Pearson, and the Countess of Scarborough, Captain Piercy. Captain Jones immediately gave chase and ordered the rest of his ships to fall in line. The British fleet crowded sail and got away but the men-of-war accepted the challenge and came up to fight.

THE BON HOMME RICHARD VICTORIOUS IN A GREAT FIGHT

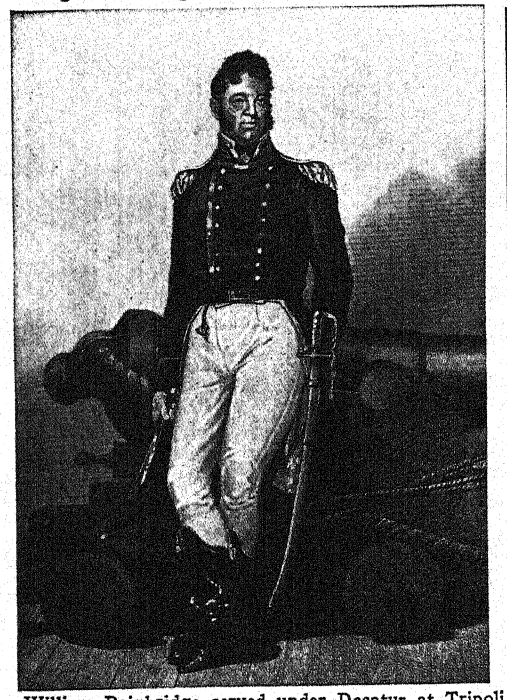
There was work ahead, indeed. Naval history does not record a more determined and terrible struggle. At one time firing on the Bon Homme Richard ceased and Captain Pearson asked if the Bon Homme

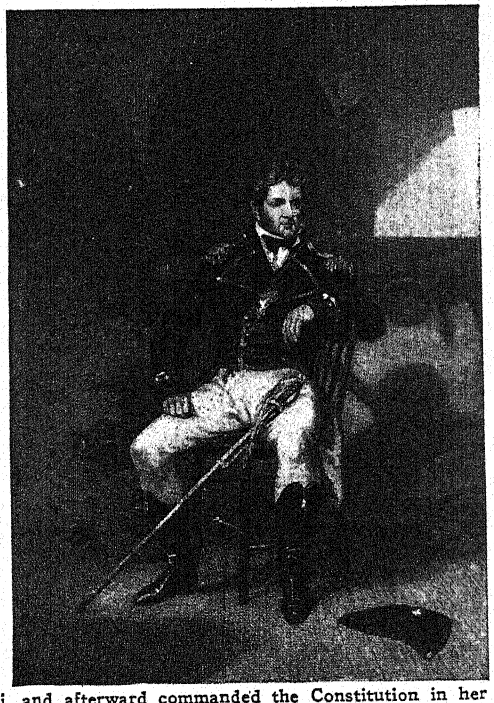
NAVAL HEROES OF THE YOUNG NATION





John Paul Jones, whose real name was John Paul, was our first great commander. After the Revolution he served in the Russian Navy, and finally died in Paris. His body is now buried at Annapolis. Lord Nelson, England's greatest naval officer, said that Stephen Decatur's exploit in the harbor of Tripoli was the "most daring act of the age." This brilliant officer was killed in a duel with another naval officer.





William Bainbridge served under Decatur at Tripoli, and afterward commanded the Constitution in her famous fight with the Java. He was an excellent officer in every respect. Thomas Macdonough's victory on Lake Champlain was as brilliant as any of the war, but the Americans had become accustomed to success by the time it occurred, and so it did not attract so much attention as some of the others.

Richard had surrendered. "No, I have not yet begun to fight," answered Captain Jones.

It was soon clear to the American captain that his only chance of success was to board the enemy's boat, if possible, and fight it out, man to man. Skilful manœuvring brought the two boats side by side, and as the Bon Homme Richard grazed the Serapis, the fluke of one of her anchors caught fast in the mizzen chain of the Bon Homme Richard. Captain Jones lashed the boats quickly together and in this way made the grapple he had tried so hard to effect and Captain Pearson had tried so hard to avoid. The Americans boarded the enemy's boat and the English saw that it was all over—Captain Pearson struck his own colors. The next day the Bon Homme Richard sank in spite of every effort, yet she captured the ship that sunk her.

At the end of the war with England the Americans had but one war-ship left, the Alliance, and she was sold for a merchantman the next year. It was clear that the new nation meant to get on without a real navy. Only a few tiny boats were kept. In spite of the heroic work done upon the seas, the people thought a large navy unnecessary.

Trouble with France came first. France was at war with England and looked to the Americans to protect the French West Indies. Washington was determined to avoid joining in the quarrel and France then attacked our ships.

AMERICAN SHIPS VICTORIOUS IN OUR WAR WITH FRANCE

Three frigates, the Constellation, the Constitution, and the United States, had been built in 1794, and Congress soon had this infant navy in West Indian waters. Two sharp encounters taught the French that the little squadron had to be reckoned with. The Constellation, Captain Thomas Truxton, met the French frigate L'Insurgent, off St. Kitts, and after several hours' hard fighting compelled the French ship to haul down her flag. Just one year later, the Constellation silenced the frigate La Vengeance in a few hours, and made her strike her colors. Both English and French seamen were amazed. The French soon came to terms.

THE WAR WITH THE PIRATES OF TRIPOLI

The clash with France was scarcely ended before the Americans' love of peace was again sorely tried. For a long time pirates from the Barbary States had been preying upon the commerce of all the Christian nations. The countries of Europe had paid tribute to these sea robbers as a means of protection and the United States did the same. But the more the United States paid them, the more dissatisfied these pirates became. There was nothing left to do but to fight it out. War was declared and the Americans soon had a squadron in the Mediterranean under Edward Preble. Stephen Decatur, William Bainbridge and Charles Stewart did some brilliant work.

When the Philadelphia, Captain Bainbridge, ran upon a reef in the harbor of Tripoli, she fell into the hands of the enemy and made a fine addition to their naval force. Stephen Decatur offered to go into the harbor and destroy her. Now the Philadelphia lay close to the shore with a pirate crew and surrounded by hundreds of the enemy's guns. In the face of all these odds the young Decatur with seventy men reached the ship, boarded her and overpowered the crew. In a few minutes the Philadelphia was ablaze and Decatur with his men were on their way back, midst a storm of shot and shell.

All this time the United States restlessly held her peace with England, but trouble with her was not long to be avoided. England in her life and death struggle with France had kept many of the French ships in port, and most of the carrying trade of the world was done in American merchantmen. If they risked a voyage to a French port, they were likely to be seized by an English man-of-war, and if they were bound for an English port they were likely to be seized by the French.

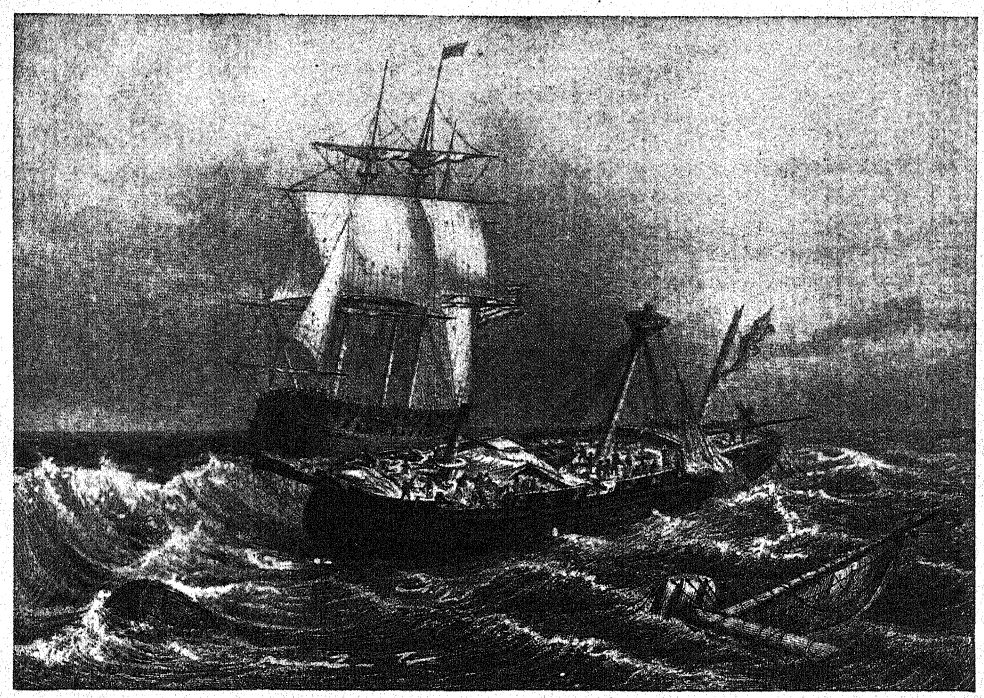
ENGLAND STOPS AMERICAN SHIPS

The Americans were exasperated at the situation, but the feeling grew worse when England seized American vessels, when and where she chose, and carried off seamen she claimed were British subjects. No doubt England was in great need of men. Her seamen had deserted her by the thousands, and she was doing everything she could to get back her runaway sailors. But she was known to take American sailors under pretence that they were her own men. War was declared in 1812.

Brilliant as the naval victories of the Americans had been whenever they were brought to fight, the country placed its chief reliance in this war on the militia. The idea of our naval ships being able to meet those of the English seemed ridiculous, and not without reason, for we had only a few ships as against England's fleet of many hundred, and her poor opinion of our "fir-built things with a bit of striped bunting for a flag at the masthead."

The masts of the Guerrière fell; great holes were torn in her sides and in less than thirty minutes from the time the firing began, she struck her flag to the Constitution. Not a spar was left standing and her hull was so damaged that it was hard to keep her above water. Captain Hull could not even bring his prize into port, so he blew her up and returned to Boston with his prisoners.

No less brilliant was the victory of the United States, Captain Stephen Decatur,



This picture represents the famous battle between the Constitution and the Guerriere, August 19, 1812. The Constitution also took the Java, December 29, 1812, the Cyane and the Levant on February 20, 1815. The vessel has never been broken up, but is now in Boston harbor. Years ago when it was proposed to break her up, Oliver Wendell Holmes wrote the famous poem "Old Ironsides," which prevented such action.

FIGHT BETWEEN THE CONSTITUTION AND THE GUERRIERE

The first encounter on the seas took place when the American frigate Constitution, Captain Isaac Hull, met the English frigate Guerrière a hundred miles east of Boston. The meeting was welcome on both sides, for Captain Dacres had entered on the log of a merchantman a challenge to any American frigate to meet him in a ship duel. The Guerrière opened fire but Captain Hull held back. He meant that every shot should tell. Crouching until the Guerrière was within pistol-shot, he sprang up and shouted, "Now, boys, pour it into them." The Constitution fired a whole broadside.

over the Macedonian. Decatur, in the United States, was sailing eastward in the neighborhood of the Azores, when he sighted a sail. The stranger made chase, and proved to be the English frigate Macedonian, Captain Carden. The enemy soon came abreast the United States and action began. The fighting lasted one hour and a half, when the Macedonian struck her colors, almost a total wreck.

THE CONSTITUTION AGAIN SUCCESSFUL

The same year the Constitution, under Captain William Bainbridge, made another splendid capture. She fell in with the Java, a ship of the same tonnage as

the Guerrière, just off the Brazilian coast. The Constitution waited until within pistol-shot of the enemy, when the command was given. In less than two hours the Java was fairly shot to pieces.

Captain Bainbridge was obliged to blow her up and land at San Salvador without his prize. The Constitution was ready for another fight two hours after the battle, and the Americans were so carried away with enthusiasm for this ship that they proudly called her Old Ironsides. Years afterward, when it was proposed to break up this ship, which was no longer of service, Oliver Wendell Holmes wrote that spirited poem, Old Ironsides, which you will find in the Book of Poetry.

The capture of the British sloop of war, Peacock, by the American boat Hornet, Master Commander James Lawrence, was much like the preceding victories in its results. The fire of the American was rapid and accurate. In eleven minutes from the time the firing began the Peacock was disabled and sank in spite of every effort to save her.

There had been a battle in the meantime between the sloops of war, the American Wasp and the British Frolic. The two vessels met off the North Carolina coast at a time when a heavy sea was running, which caused both to pitch and roll so that marksmanship had much to do with the outcome of the fight. Often the muzzles of the guns were under water. The enemy surrendered after forty-three minutes of terrible fighting. But Commander Jones lost the full satisfaction of his victory, for while the crew in the Wasp was repairing damages, a British frigate came into view, recaptured what was left of the Frolic and took her and the Wasp to Bermuda.

What the English thought of American ships

Never had the English suffered such a series of defeats as the Americans inflicted upon their navy. Even the smaller vessels were victorious. The Enterprise took the Boxer. The Essex, under Captain David Porter, sailed around Cape Horn and captured many merchantmen. One Englishman said that there was scarcely an American ship that could not boast a victory over a British flag.

The first ship was lost when the frigate Chesapeake surrendered to the Shannon. The Chesapeake was at anchor in Boston harbor, where Captain James Lawrence was sent to fit her out for sea. When he arrived there he found that nearly all of her old crew had left the ship, and Captain Lawrence was forced to man the vessel with a crew of untrained, riotous men. While he was gathering them together, Captain Broke of the Shannon sent a challenge to the Chesapeake asking for a ship duel in any place that the American captain named. He accepted the challenge and met the Shannon at sea. After a short, fierce fight the fire of the Shannon proved too much for the Chesapeake. She was terribly shattered and Captain Lawrence was mortally wounded.

This loss was followed by others. The American ships were so few that before long they were either captured or blockaded in port, but the American navy had made a record that will never die. The naval war was now transferred to the lakes.

Perry's victory on Lake Erie

Meantime, as we may read in the Story of the United States, the war was being waged on land, and on the Great Lakes. One decisive battle, won by young Perry, gave the Americans the command of Lake Erie, and this battle has stirred Americans as no other battle in our history has ever done.

The loss of Detroit soon after the war began was a great blow, for the British then came into possession of the whole Northwest Territory, and with it passed the control of Lake Erie. Now Detroit without the command of the lake would have been of little use to the British, for at that time it was impossible to send sufficient supplies overland to the British soldiers stationed there. So if the Americans could get back the control of Lake Erie the first step toward recapturing Detroit, and in the end the whole of the Northwest Territory, would have been taken.

The young naval officer who was to secure control of the lake

Things looked unfavorable for the Americans, when Oliver Hazard Perry, a young naval officer, was sent to Presqu' Isle, on Lake Erie, to take charge of a small squadron that was being built there. Perry, who had been in the navy from his fifteenth year, had served as a midshipman in the war with Tripoli. After

the War of 1812 began he was for some time in command of a little fleet of gunboats on the Atlantic coast, and though he was only twenty-seven, he had already given proof that he was a skilful commander, as well as a brave and daring man.

When he arrived at his new station, he found the keels of two brigs laid and three gunboats well under way. The two brigs were the Lawrence, named after the unfortunate captain of the Chesapeake, and the Niagara. With a gang of ship carpenters the young Perry set to work to finish building and to equip a little squadron in a place that was almost a wilderness. They cut down trees from the western shore of the lake and used the green timber for the vessels, while most of the material for equipping the ships had to be brought 500 miles from the seaboard.

Now the British had been building ships, too, and their new ship, the Detroit, was nearly ready for service.

The quick work of the American seamen had aroused the alarm of the British. Captain Barclay, one of Nelson's veterans, in command of the British fleet, meant to have his squadron on the lake and keep the American ships blockaded near Presqu' Isle, but Perry was too quick for him. His ships were already on Lake Erie and he was on the lookout for the British.

A BATTLE NECESSARY FOR BOTH SIDES

The British squadron, finding Perry in full control of the lake, remained at Malden, on the Detroit River. Captain Barclay had great trouble to get a crew and he was determined not to come into action until he had what he thought was the full equipment of seamen. But difficulties about the food supply were staring him in the face. He could no longer get food in his neighborhood and the presence of the American squadron made it impossible for him to reach Long Point, the supply station, without coming into open fight.

In the meantime the American squadron had decided not to wait for the enemy, but to sail over to Malden and attack the British at that place. So Perry's fleet set sail for that purpose. At sunrise on September 10, 1813, the lookout at the masthead of the Lawrence sighted the British squadron in the northwest. Captain Barclay's seamen were hungry and he had decided that he must open communications with Long Point even if it meant fight.

THE STRENGTH OF THE TWO FLEETS COMPARED

There was some difference in the strength of the two fleets. Perry had nine ships while the British had six, but the latter carried more guns. The British vessels were larger but their guns were smaller; and then, Captain Barclay had served under Nelson at Trafalgar, while the young American commander had to make up in spirit what he lacked in experience. But he had spirit enough for what was to follow. "To windward or leeward they shall fight to-day," was his command when the British hove in sight.

THE BATTLE RAGES

Perry in his flagship, the Lawrence, displaying a blue banner, bearing the words, "DON'T GIVE UP THE SHIP," advanced, but the British in line in close order awaited the attack. The Lawrence hailed. The British waited until she was within range, and then made her a target for their fire. The fighting that followed was most desperate and the Lawrence was soon almost a wreck. Perry fought her until nearly all of his men had fallen. It was a supreme moment—most men would have surrendered. He saw it would be madness to stay longer in his shattered ship. With eight men, and his little twelve-year-old brother, he jumped into a rowboat and, standing, blue flag in hand, made straight through a shower of shot and shell for the Niagara, another vessel of his fleet, which had not suffered much harm. With renewed energy the battle then raged with greater violence than before. The few men left on the Lawrence were compelled to haul down their flag, but the British were too busy to take possession of her. Perry sailed into the very midst of the British fleet. He tore through their lines, pouring broadsides right and left. In fifteen minutes Captain Barclay was compelled to surrender and Perry's great victory on Lake Erie was won. For the first time in history a despatch bore the message that an entire English fleet had been captured. "We have met the enemy and they are ours—two ships, two brigs, one schooner and one sloop."

As a reward for his victory, Perry was made a captain, was thanked by Congress, and was presented with a gold medal. He did not live long to enjoy his honors. At that time it was necessary to keep war-ships in West Indian waters to protect American ships against the pirates who infested them. Seven years after his victory, Perry was sent down with a squadron to perform this duty, and died there of yellow fever on his thirty-fourth birthday. A hundred years later



This painting shows the dramatic moment when Commodore Perry, leaving his shattered flagship, the Lawrence, was rowed over to the Niagara to begin the battle with renewed energy. The flag was not the stars and stripes, however, but the blue banner on which were Lawrence's dying words, "Don't Give Up the Ship." Artists sometimes neglect what they consider small details like this use of the wrong flag.

great celebrations were held at different points along Lake Erie, and at Put-in-Bay a memorial was unveiled to the men who had fought so bravely and so well. Matthew C. Perry, who commanded the fleet which opened Japan to the world, was a younger brother of O. H. Perry, and lived nearly forty years longer.

OTHER NAVAL BATTLES ON THE LAKES

In Lake Champlain was another American fleet of fourteen small vessels under Thomas Macdonough. This was attacked September 11, 1814, by a large British fleet under Captain Downie, but Macdonough's bravery and skill won the day. The British lost two hundred men besides prisoners, while the American loss was only a hundred and twelve. Peace was soon declared with all the honor of the war due to the navy. Except at New Orleans, no important victory had been won by the army.

The United States has now one of the largest and strongest navies in the world. One of the smallest ships of the present day with its armor and rifled guns could destroy the whole fleet of the War of 1812, but Americans will never forget the sailors and the ships of those stirring times.

During the century and more since the close of the War of 1812, the American navy has always been ready to fight, even in the days when it was small and weak. During the Civil War, the Spanish War, and the Great War, the navy bore itself well, but we cannot stop here to tell of Farragut, Porter, Dewey, Sampson, Schley and all the rest. Whether they serve upon battleships, destroyers or submarines, the American officers and sailors have always been ready to do their whole duty whenever and wherever they may be called.

THE NEXT STORY OF MEN AND WOMEN IS ON PAGE 3023.

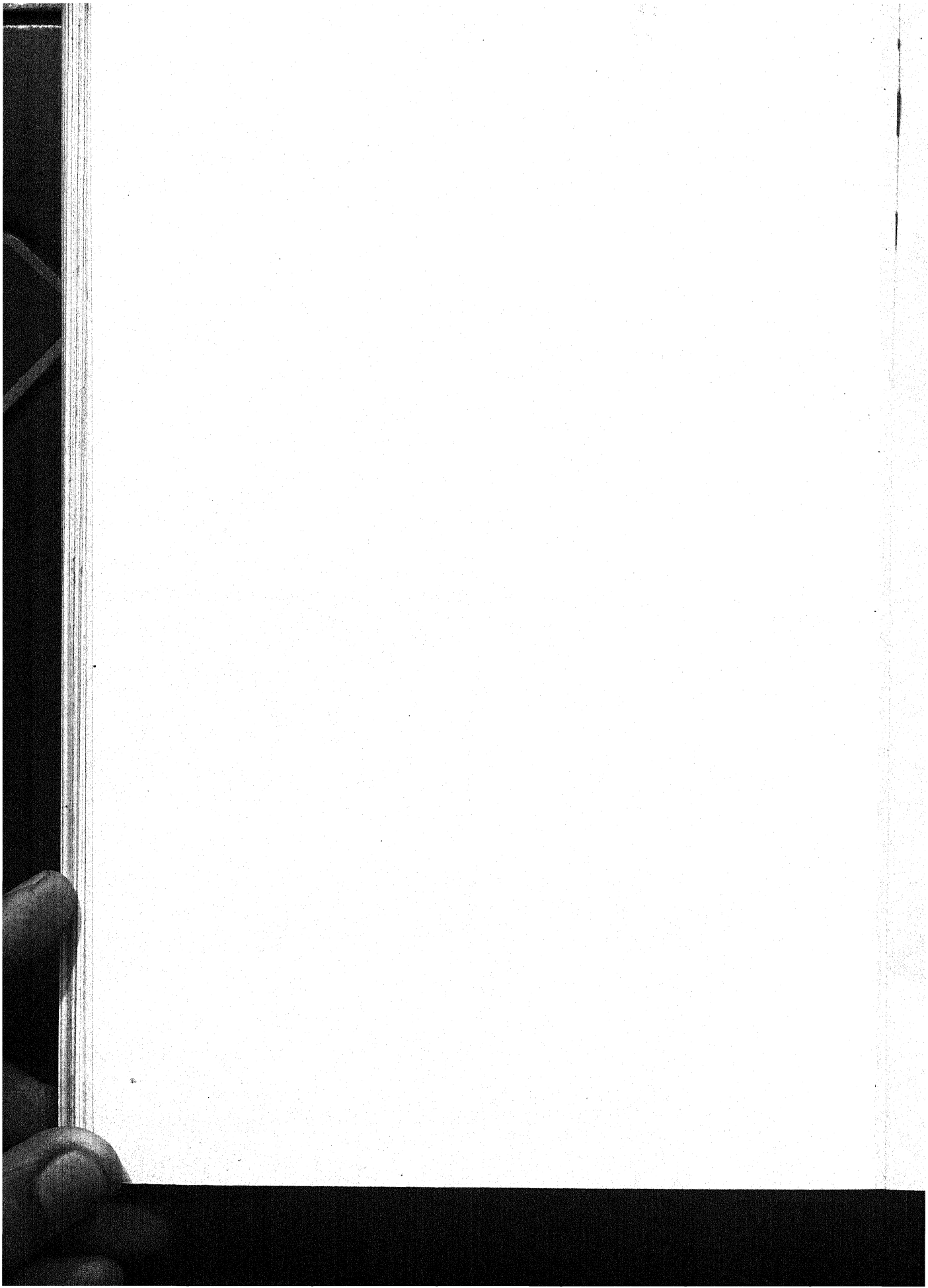
SOME WELL-KNOWN BUTTERFLIES AND MOTHS

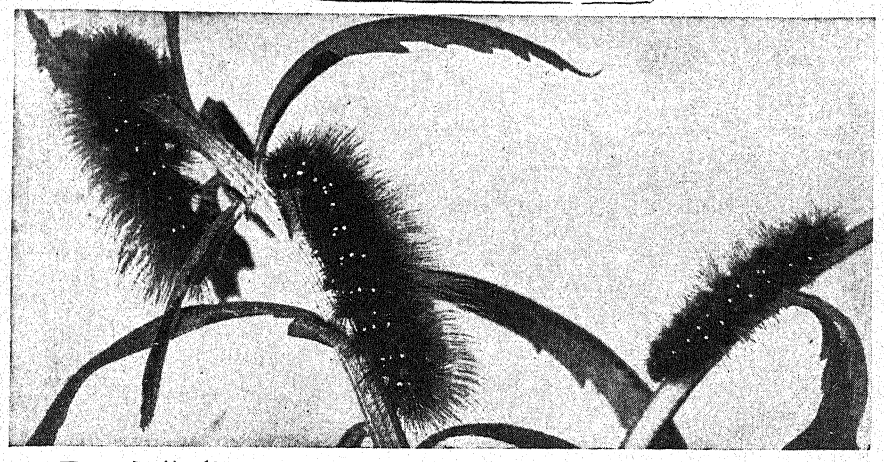


Butterflies and moths are among the most beautiful creatures in all Nature, and as they flit in the brilliant sunshine their gay wings glint and flash in the light, and add wonderfully to the glories of the country. Here are some well-known butterflies and moths, with a few of their caterpillars.

1. Silver-washed fritillary
2. Swallow tail butterfly
3. Red admiral butterfly
4. Small copper butterfly
5. Peacock butterfly
6. Purple emperor butterfly
7. Painted lady butterfly
8. Orange-tip butterfly
9. The mourning cloak
10. White admiral butterfly
11. Large white butterfly
12, 12a. Humming-bird hawk moth
13, 13a. Privet hawk moth
14, 14a. Goat moth
15. Scarlet tiger moth
16, 16a. Eyed hawk moth
17. Clifden blue butterfly
18. Puss moth
19. Kentish glory moth
20. Buff-tip. 21. Magpie moth

Butterflies and moths both belong to that order of creatures which scientists call lepidoptera, a long word that means simply "scaly-winged," and the name is given because their wings are covered with scales or tiny feathers, that appear to the naked eye like fine dust. Butterflies and moths differ very little from each other. The butterflies fly mostly by day and moths by night, but there are exceptions in both cases.





BUTTERFLIES AND MOTHS

CONTINUED FROM 2974

EVERY boy and girl can have a year of fascinating study as the result of a short ramble in the garden. We can trace the butterfly or moth from the time it leaves the egg, through all its changes, until from its egg another butterfly or moth is born. With some, the life-history does not take a year to run its course, but if we get a moth or butterfly whose chrysalis lives from the end of autumn until the beginning of summer, we shall have provided against the dull winter months. When we have watched the course of life through which these insects pass, we shall have been witnesses of one of the most wonderful series of events in Nature.

The life of the bee and the life of the ant make the wisest men wonder. But the deeper we go into the mysteries of Nature, the more we learn—the more we realize how ignorant we really are. We know all that happens in the life of the caterpillar, from the egg to the fully developed butterfly, but we do not know why it happens as it does.

Here we have a similar course to that run by the bee and the ant. First there is the egg; next there is the caterpillar, or larva; after that the chrysalis, or pupa; and finally the perfect insect with wings, which is called the imago. The larvæ of the bees and ants are protected until the perfect insect appears. The bee is in its cell; the ant is underground, watched by full-grown ants, who are tender nurses as well as bold defenders. But the case of the caterpillar is different. Born from a tiny egg, it is so small that, in some cases, we cannot tell for a day or two whether the eggs have actually hatched. We have to use a magnifying glass, and breathe on the mass of tiny life, if the day be cool, to stir it into activity, and so make sure that the little caterpillars are born.

There could not be a more helpless thing than the caterpillar is at this stage. If we kept some caterpillars in a case, and a few ants got into the case, they would soon eat up all the young larvæ. By the way, they will do the same with big caterpillars too, if we are not careful to have a box or case with holes too small to give the ants admittance. A small boy who left three lovely caterpillars safe and sound feeding on leaves in a big match-box overnight, sat down and wept in the morning when he found what had happened. The ants had made their way into the box, and had eaten two of the caterpillars, and the moment the little owner opened the box they began to pull the remains of the third caterpillar out after them, to carry it off to their nest. That serves to remind us how defenceless the poor caterpillar is. Yet in this weak and

helpless state the caterpillar must live its life, or we could have no butterflies to brighten the gardens and the woods; no gorgeous moths to make the country lovely. Might it not seem as if Nature had for once made a mistake in exposing one of her families to the perils which the caterpillars run, with so many enemies—birds, animals, and insects—ready to pounce upon them and gobble them up? That is the puzzle which wise men have studied.

Nobody can say positively that he knows exactly why the life of the butterfly should run just as it does, but we are able to work out a theory by which it may be explained. Creatures which are born from large eggs are provided with so large a mass of food in the egg that when they emerge they are well developed, and able soon to look after themselves. Birds which are born from tiny eggs are always helpless. Take the strong, healthy young chicken from the big hen's egg, and contrast it with the puny baby pigeon, so helpless and feeble.

CATERPILLARS THAT FEED HEARTILY & SOME BUTTERFLIES THAT EAT NOTHING

Well, the creature which comes from the small egg must grow big and strong. But as soon as it reaches maturity, and becomes a perfect insect with wings, it wants to lay its eggs. There are many eggs to be laid, and it must have greater strength to supply them than the food of any butterfly could yield if, at the same time, it has to go on growing. Therefore Nature has provided a middle course—the caterpillar stage.

The caterpillar can eat an extraordinary amount of food, whether it be leaves, or the bark of trees, or, in the case of the larvæ of the clothes moth, wool and fur. Butterflies and moths cannot "eat" things; they only sip honey and other liquids. The bodily strength must be acquired by the caterpillar, for some of the perfect insects have so poor a mouth that they cannot take *any* nourishment; their whole life on the wing as a rule lasts only about three days, and during that time they can eat nothing.

But the caterpillar is a great feeder, and that is the fact which winds up our theory. If the strength of the butterfly or moth is to be built up upon what the caterpillar eats, the caterpillar must eat heartily. The butterfly and moth lay a great many eggs. Now, if all these ran their full course, if they all became caterpillars, and in the end turned into other butterflies and moths, then very soon the world would be deprived of nearly every green thing; the caterpillars would eat all the vegetation off the face of the earth.

THE MAGIC STORY OF THE INSECTS WITH THE BEAUTIFUL SCALY WINGS

So Nature, while giving the moth and the butterfly power to undergo these marvelous changes, plans that there shall be a period of comparative helplessness in the caterpillar's history lest all plant life should be killed. With these thoughts in our minds, let us now take a nearer view of the magic story of these beautiful insects' lives.

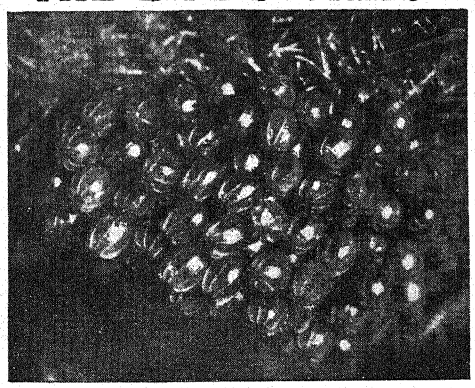
It is not easy to divide the moths clearly from the butterflies. Together they form what are called the lepidoptera order—that is, the order of insects having scaly wings. Instead of being covered with hair, these creatures have their wings covered with the tiniest powdery scales. These scales are of various forms and sizes, and are fixed at various angles to the wings, whose delicate membranes they serve to cover and protect. It is these little powdery scales which, breaking up the rays of light, give the butterflies and moths their lovely shades of color. Both butterflies and moths are clad in this way, so the distinction does not lie there.

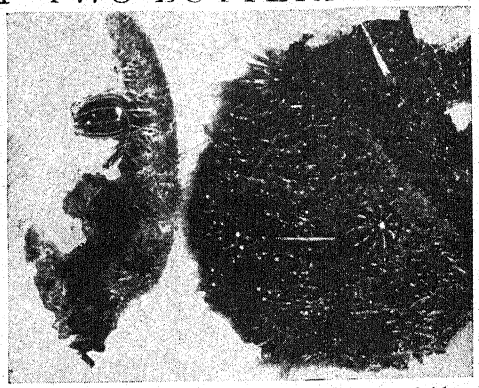
We think of moths as creatures which come out only at night or in the twilight, like the bats and owls. But there are moths that fly by day, and not at night. Night-flying moths are very rare in parts of America, owing to the great number of bats and insect-hunting birds which are on the prowl when darkness sets in and would seize them.

THE WONDERFUL ARRANGEMENT OF HOOK & EYE THAT FASTENS THE MOTH'S WINGS

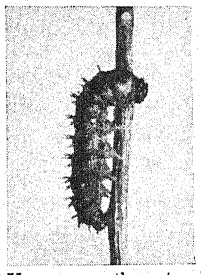
Most varieties of moths do fly by night, of course, but these exceptions show that we cannot make the matter of their hours of activity the point upon which to decide whether an insect is a moth or a butterfly. Even a great naturalist finds this difficult to decide. At one time it was thought that moths could be distinguished by a beautiful little hook and eye arrangement which fastens the front and back pairs of wings to each other. But it has been found

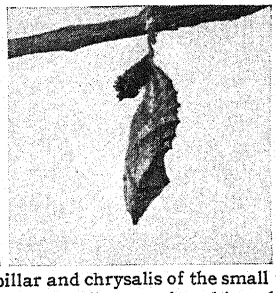
THE LIFE-STORIES OF TWO BUTTERFLIES

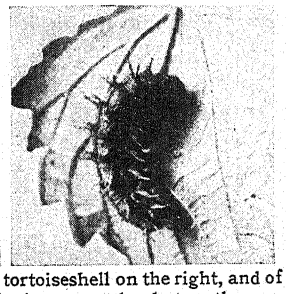


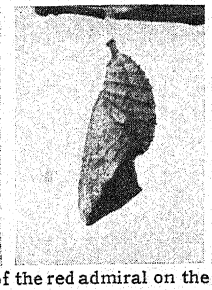


In the picture on the left we see the eggs of the small tortoiseshell butterfly, magnified. They are laid on the underside of a nettle-leaf, and are exactly the color of the leaf. On the right is the red admiral butterfly's egg, seen first from the side and then from the top. It can be distinguished by the white rib-like markings.

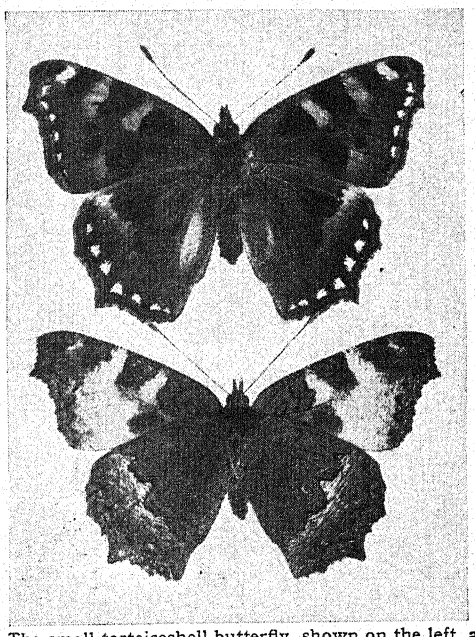


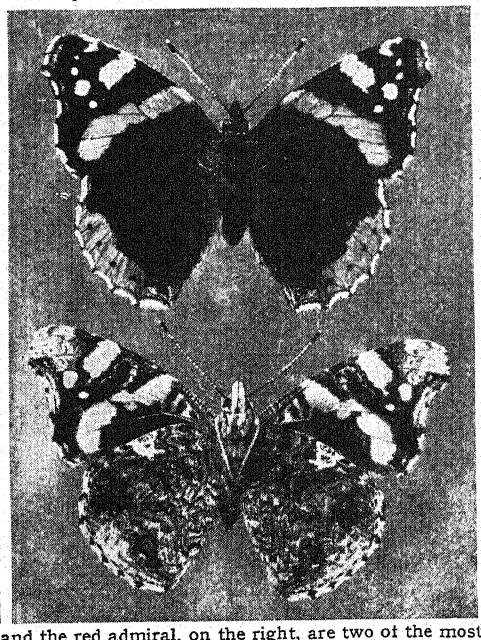






Here we see the caterpillar and chrysalis of the small tortoiseshell on the right, and of the red admiral on the left. The tortoiseshell's caterpillars are found in colonies on nettles, but as they grow bigger they separate to search for food, and soon change into the handsome gilt-spangled chrysalis. The red admiral caterpillar, on the other hand, prefers a solitary life, and it protects itself from the weather by drawing leaves round it with a silken thread. Its chrysalis, like that of nearly all the butterflies, hangs by a single thread.





The small tortoiseshell butterfly, shown on the left, and the red admiral, on the right, are two of the most common British butterflies, and the latter is one of the most beautiful. In the pictures, as in those following, the top specimen shows the beautiful upper side of the creature, and the lower picture the dull underside.

The photographs on these pages are by A. E. Tonge and J. J. Ward.

that some moths lack this provision. The main distinction between the fully developed insects is that while the butterfly's antennæ are club-shaped at the tips, those of most of the moths are plain, though often feathered. This distinguishing mark is true of all moths and butterflies found in the United States and Canada.

THE BUTTERFLIES THAT FEED BY DAY AND THE MOTHS THAT FEED BY NIGHT

The habits of both sections are very similar. The butterflies generally live by feeding on the nectar of flowers by day; the moths, for the most part, take the same sort of food by night. Both lay their eggs on plants or on other material which will provide food for the caterpillar when it leaves the egg. The chief distinctions between the caterpillars are two. The first is this: that the caterpillar of the moth, when it changes its form, generally spins for itself a cocoon of silk, or makes some other form of dwelling in which to undergo its alteration; whereas the caterpillar of the butterfly is, as a rule, content to suspend itself by one silken thread, or at most a band of silk woven about its middle. The second distinction is that the chrysalis or pupa of the butterfly is commonly of a golden color; the chrysalis or pupa of the moth is generally a deep reddish brown.

The perils of the caterpillar begin before the caterpillar is born. The parent lays the eggs in a position where, in spite of all her care, they may be eaten by beetles or small birds. Luckily for the family, as a rule the eggs are not all laid in the same place. The butterfly or moth chooses a place which will suffice to feed the young caterpillars when they are hatched; and lays an instalment of eggs. Then she goes to a similar place and deposits a second instalment.

THE LITTLE CATERPILLAR THAT BURSTS ITS SHELL AND AT ONCE GROWS HUNGRY

The eggs may be of various sizes, shapes, and colors, but the process which they undergo is always the same. If the weather be warm they will, in most cases, be hatched in eight or ten days, and a weak little caterpillar bursts its shell and at once grows hungry. The first thing it does is to gnaw the leaf upon which it finds itself, or to eat the shell of the egg from which it came. It soon begins to increase in size. It eats as if nothing could tire it. Its powerful jaws enable it to eat and gnaw the leaves upon which it finds itself, and so good does this food prove that, in a few days, the caterpillar becomes too large for its skin.

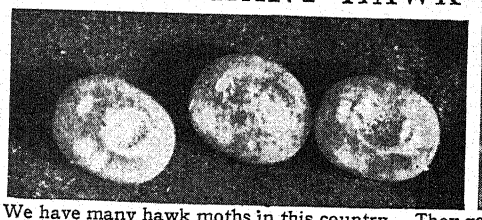
Therefore it has to undergo a molt. This is a long and difficult process, for the old skin has to be rent down the centre of the back, and the caterpillar has to draw its entire body—legs, feelers and all—through the rent. Nor is that the worst of it. Like some of the shell-fish, the poor caterpillar must cast aside the lining of the canal down which its food passes—it is a complete molt of the skin of the caterpillar, inside and out. After the task is finished the caterpillar is quite exhausted, and it has to take a good rest to recover. While it is resting, its jaws, which have been soft since they lost their covering, become hard again, and soon the spirits of the caterpillar revive, and it goes on feeding and feeding, until it becomes necessary to undergo another molt.

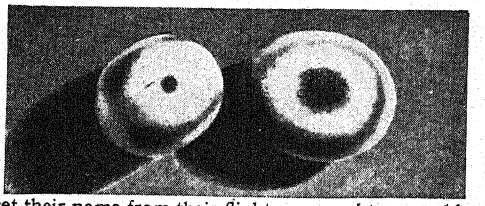
HOW THE CATERPILLAR'S LIFE IS MADE UP OF FEEDING AND CASTING ITS SKIN

The form of this second molt is the same as the first. The caterpillar's life is made up of feeding and casting its skin. No sooner has it become vigorous and hearty than it must jump out of its skin again. This may happen from five to ten times. It all depends how long the caterpillar is to remain a caterpillar. Some change into chrysalises at the end of a month, while others, like the caterpillar of the goat or carpenter moth, remain in the larva stage from two to four years. The caterpillar of the privet hawk moth is one of the caterpillars in a hurry. It is that very beautiful light green caterpillar which has pretty stripes along both sides, and a little curved spike over the tail.

This becomes a very big caterpillar, but it does all its growing in a month. Six times in the course of its first twenty-two days of life it changes its skin. After the sixth molt it seems to know that there will be no more trouble of this sort, and it feeds itself up as if it were going in for a show. Ten days after the sixth molt it reaches its fullest size, and it is then ready to become a pupa, or chrysalis. By this time it has eaten so much that its weight is

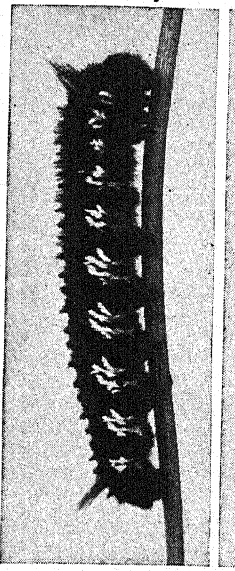
THE ELEPHANT HAWK & THE DRINKER MOTH





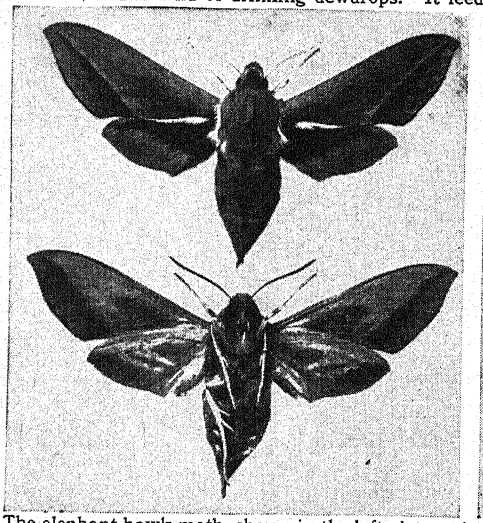
We have many hawk moths in this country. They get their name from their flight, supposed to resemble that of the hawk. On the left we see the green eggs of the elephant hawk moth, magnified 100 times. On the right are the eggs, also enlarged 100 times, of the drinker moth; they are white with a central green spot.

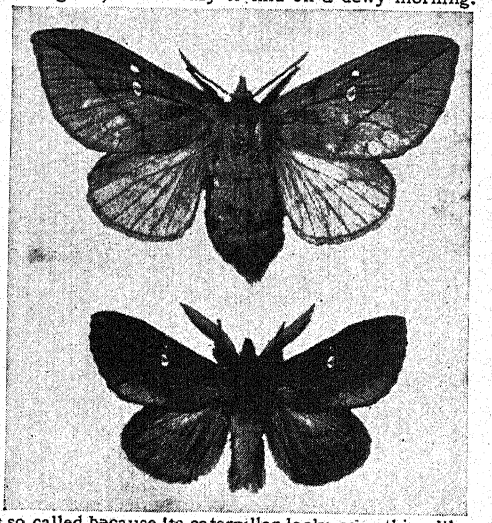






The caterpillar of the elephant hawk moth is green at first, but when about half grown it changes to a purplish brown. The chrysalis, enclosed in a loose cocoon, passes the winter on the ground among the roots of its food-plant, willow-herb. In the left-hand picture we see both stages of the elephant hawk, and on the right the caterpillar and chrysalis of the drinker moth. This latter hides among the rubbish in hedge-bottoms, and is fond of drinking dewdrops. It feeds on grass, and is easy to find on a dewy morning.





The elephant hawk moth, shown in the left picture, is so called because its caterpillar looks something like an elephant's trunk. It is one of the smallest hawk moths. On the right we see the drinker moth, which gets its name from its large proboscis, or trunk, with which it drinks. The female is larger than the male.

11,312 times as much as the weight of the same caterpillar when it was born. Then there is the goat moth; what has he done in his years of caterpillar life? He has made himself 72,000 times as heavy as when he left the egg. The case of the privet hawk moth has been mentioned only because he is a popular garden beauty, not because his appetite is exceptional.

One caterpillar, which lives on the oak-tree, was watched for fifty-two days, and in that time he was found to eat 120 oak leaves, weighing three-quarters of a pound, and to drink half an ounce of water. The food which this hungry caterpillar had eaten in that time was equal to 86,000 times the weight at which that caterpillar left the egg. If we want another hearty feeder, let us buy a few eggs of the silkworm moth, let them hatch, and watch the caterpillars at mulberry leaves. When the caterpillars are all busy at work on their meals, their munching sounds very much like the rustling of paper.

HOW THE CATERPILLAR CASTS ITS SKIN AND BECOMES A CHRYSALIS

The chief aim of the caterpillar's life is to be fat and strong in readiness for the great day when its form must be changed. That is the day upon which it turns into a chrysalis. We must look back, afterwards, to the precautions taken in readiness for this day—to the cocoon-spinning, and so forth. Here we can go straight on with our story, because, as we have seen, the butterfly chrysalises make little preparation in the way of spinning. The last molt of all comes on this day.

We leave our caterpillar looking fat and lazy. When we return to his little home we find a caterpillar no longer. There, on the floor of the case or box, lies his old skin; beside it is a smooth chrysalis, or pupa, looking something like a date-stone. Nothing but this smooth little horny cylinder remains. It is as if our handsome caterpillar, which we have fed from its birth, had died, and left us nothing but a small ringed tube to remind us of the past. No one would think that there was life in the chrysalis. But take it up carefully and let the warmth of our hand be felt by the chrysalis, and the latter will wriggle, perhaps because it is annoyed—if a chrysalis is so silly as to feel annoyed—perhaps because it likes the warmth.

THE MIRACLE OF A BUTTERFLY'S BIRTH FROM A CHRYSALIS THAT LOOKS DEAD

Whatever the case, there is our caterpillar turned to a pupa, or chrysalis, and in that state it lies like a dead thing for days and days. We see nothing from the outside beyond the dull, horny cover, which is about as interesting as an empty shell. But within that covering a miracle is being performed. The body of the caterpillar is being remade while we wait. It may take only a fortnight if the weather be warm at the time. At the end of that period the chrysalis will open at the top end; the top ring will come off like a lid, and a lovely moth or butterfly will creep out. The big, biting jaws for eating vegetation have gone, the old legs in front and the stumpy false legs at the back have disappeared, and new legs have grown in front.

When it comes out of the chrysalis shell, the moth or butterfly is very helpless. Its legs are weak; its wings small, damp and powerless. But as it fans its wings, the warm air drys them, the motion sends the blood along their veins and they become strong. The long caterpillar-like body, which would hinder the butterfly's flight, dries up and hardens, and in a few hours the beautiful insect, strong and free, is ready for its first joyous flight. We have watched the whole process from the time that the butterfly laid the egg. We have seen the egg turn into a caterpillar, and the caterpillar turn into a chrysalis, and we have now seen the chrysalis turn into a butterfly.

But all this may have taken only a few weeks. The cabbage butterfly, as we all ought to know, lays two batches of eggs every summer, and those eggs quickly hatch. Where, then, is the year's entertainment which the process was to afford us? The answer is that we must not depend upon one species.

A QUICK-CHANGING CHRYSALIS AND A CHRYSALIS THAT SLEEPS ALL WINTER

We must have a caterpillar which will quickly turn into a chrysalis, and from that to a butterfly. But we must have also a caterpillar which, after becoming a chrysalis, will last through the winter in that state, and be a feast of wonder for us until the glad days of

summer come again, when we may renew our store of eggs and continue the hatching process with other varieties.

The chrysalis stage, though it is rather trying to the impatient, is one of the most marvelous things in Nature. In the study where this story is written many caterpillars and butterflies have been born. A little girl and a friend have splendid times in this butterfly nursery. She never fails to find him some big, fat caterpillars, and he in return seeks among the bushes and finds clusters of others in their webs, or the eggs of moths and caterpillars laid upon out-of-the-way leaves. Between them, this clever little girl and her friend brought up a big family of the loveliest silver, pearly moths, speckled with black.

They took the caterpillars from a variegated privet-bush, and fed them on fresh leaves every day; and saw them weave themselves into webs, and finally wrap themselves up, one by one, each in its little nest of spun silk, and each leaving its skin outside. And then they saw them hatch into these lovely moths, and finally turned them loose in the garden from which the caterpillars came.

HOW A LITTLE GIRL'S HAIRY CATERPILLAR CHANGED INTO A FAT CHRYSALIS

Of course the gardener would not be at all pleased about the moths being turned loose, for their caterpillars damage the trees and shrubs that he so lovingly tends; but not even skilful gardeners can have all their own way.

In this study, which is also a nursery for butterflies and other things, there rested all the winter days a great fat chrysalis. Before, it was a fine hairy caterpillar, gay with black and gold. It was the little girl's "find," and they kept it in the big box which was the cradle of the others. Its caterpillar life was passed in the pleasant days of summer; in the chrysalis form it braved the cold days of winter. People, looking at it, thought that the chrysalis was dead, but its two keepers knew better. They knew that they had only to hold it for a minute or so in their hands for the warmth to make the chrysalis stir and wriggle. They knew that in the warm days of early summer the dark old case would be split open at the top, and that there would come forth a lovely great moth.

We think it wonderful that bears and other animals should have the power to sustain life while sleeping all through the winter, but surely it is far more wonderful that so small a thing as a caterpillar should be able to store up within itself strength enough to carry it all through the terrible days of winter.

SOMETHING THE GENTLE CATERPILLAR CAN DO THAT THE FIERCE WASP CANNOT DO

The big, fierce wasps cannot do this; only their queens live through the winter. This power is one of the gifts which Nature has bestowed upon the caterpillars of moths and butterflies. Others of their order can sleep through the worst of the summer days in the scorching lands where winter never comes. They remain in the chrysalis stage when the vegetation is scorched up, and come out when flowers and fruit are in their glory.

So far we have thought only of the caterpillars that pass their time in the open in an average American garden. There are others which are compelled to take greater precautions. One family of tiny caterpillars cannot live in this way. They are called miners, and live inside leaves. By the most skilful method of cutting, they bore their way into leaves, and make a chamber actually inside the leaf. They feed on the inside of the leaf. They gnaw at the fibrous stalks, or nervures of the leaves, to make them smooth and level with the flesh of the leaf, and when they have made the chamber within the leaf large enough, they spin a complete covering of silk, as if the interior of the leaf were too rough for their tender skins. Another caterpillar, not satisfied with his retreat in the stalk of a plant, makes a sort of trap of bristly hairs at the entrance, with the spikes pointing outwards, so that while he can go out, no deadly insect can get in to eat him up.

A POOR LITTLE CATERPILLAR THAT COULD NOT BECOME A CHRYSALIS

And that brings us to one of the great tragedies of caterpillar life. The little girl of whom we have been reading had a caterpillar in a poor sort of cocoon for weeks and weeks. She noticed that it had not been able to cast its skin as the others had done, and that it repeatedly fell from the top of the box to the bottom when climbing up to spin. At

last it settled down in a corner at the bottom of the box, and spun this poor cocoon, and could no longer be seen. Days passed away, and when the little girl opened the box there was no sign of change in the caterpillar. But each time a fly would buzz out in her face, and make her slam the box indignantly, and ask: "Who has been putting these nasty old flies into the caterpillar box?"

At last the little girl's friend got his magnifying glass, and carefully examined the cocoon. Then he cut the cocoon out of the box, and was able to explain the mystery. The body of the caterpillar inside the cocoon was dried and hollow; it was a mere wrinkled skin. All round it were tiny chrysalis cases—empty. It was from these little cases inside the cocoon that the flies, which annoyed the little girl, had come. When the caterpillar was at liberty in the garden, an ichneumon fly had perched upon it. Driving her sharp needle into his back, she had made little holes, and in each she had deposited one of her eggs. These eggs were in the body of the caterpillar when the little girl caught it. The eggs had hatched in the caterpillar's body, and little grubs had come forth from them and eaten the flesh of the caterpillar. Then they had changed into chrysalises, and at the right time had burst their cases and come forth as fully developed ichneumon flies, ready to fly out when the little girl opened the box.

CATERPILLARS THAT HIDE IN TREES AND CATERPILLARS THAT GROW HORNS

That is a horrid tale, is it not? But it is the sort of thing that is going on around us in the gardens and fields and woods every summer's day. The caterpillar lives until the grubs of the fly, hatched from their eggs, eat it up. It is supposed that the caterpillar feels no pain; that its nerves are paralysed by the mother ichneumon, but that it has just strength enough to live until the little flies hatch.

That is only one of the dangers of the caterpillars. The birds devour myriads of them. Some, to avoid their enemies, bore their way into the decayed trunks of trees, and there undergo their change. When they are about to turn into chrysalises, they work their way near the bark of the tree, so that the moth which comes forth in due time shall have no difficulty in making its way out. Other caterpillars are covered with hairs, which not only serve to protect them if they fall, but make birds dislike them as food. Some cuckoos live almost entirely on hairy caterpillars which other birds will rarely touch. Big hawk moth caterpillars have horny hooks over the rear segment of the body, and they look quite formidable as they whirl from side to side when handled, or try to frighten enemies by assuming the most alarming attitudes. Other caterpillars feign death, and some, as they crawl along the branches, can so imitate the look of a dry twig that they escape the eyes of their enemies.

ARMIES OF CATERPILLARS THAT STRIP FORESTS AND STOP TRAINS

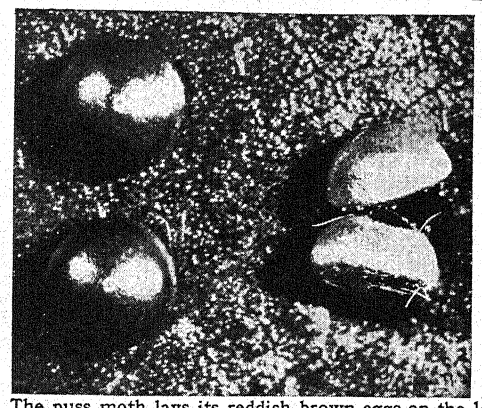
A whole book might be filled with the wonders of caterpillar life, about their spinning and building, and so forth. The silkworm itself demands special mention, and we have read a story about that in another part of the book. The subject of the damage done by caterpillars is, of course, very important, but we must leave that, remembering that the ravages of these insects are so severe in some years that they can strip a forest of leaves, and when on the march, go in such enormous multitudes that they can even stop railway trains by making the lines impossible for the wheels of the carriages to grip. But we must pass on now to the final stage.

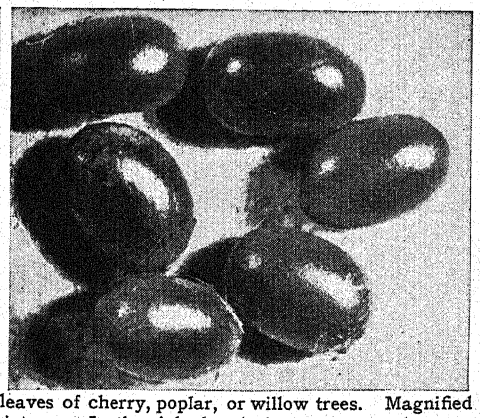
As soon as it leaves the chrysalis, the moth or butterfly dries its wings, and flies away to seek a mate. Generally the males are the more handsome. A bright-colored female might attract attention while she was laying her eggs, and she would be killed. With the males it does not so much matter, as after a few short days their lives end. Even they, however, have in many cases means of protection. As they fly with gorgeous wings outspread, lovely as the birds of paradise, one might think that they could not escape detection. But watch one of the handsomest as it settles. In a twinkling the butterfly which we have watched to a tree or a bush has vanished.

HOW BUTTERFLIES CLOSE UP THEIR WINGS AND BECOME INVISIBLE

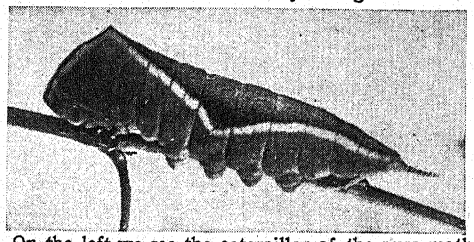
The wings are brought upright together over the butterfly's back, leaving only the under sides showing, and the coloring here very much resembles the color of the branch on which the insect rests.

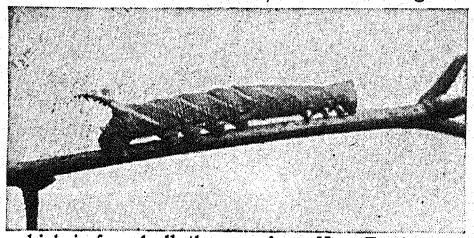
THE PUSS MOTH AND THE LIME HAWK MOTH



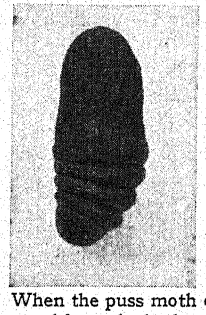


The puss moth lays its reddish-brown eggs on the leaves of cherry, poplar, or willow trees. Magnified a hundred times they appear as in the left-hand picture. In the right-hand picture we see the eggs of the lime hawk moth similarly enlarged. These are laid on lime or elm leaves, and are a dull green.

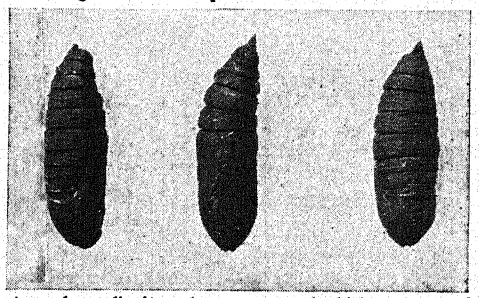




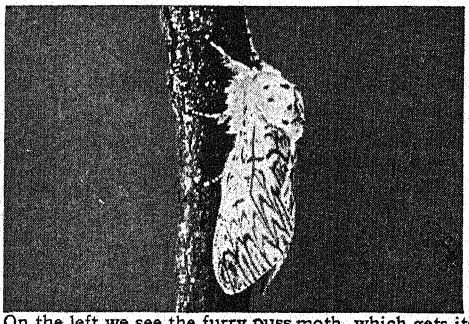
On the left we see the caterpillar of the puss moth, which is found all the way from New England to Mexico. It has a curious appearance when resting, and from its tail throws out two orange-colored threads that frighten away ichneumon flies that attack it. On the right is the caterpillar of the lime hawk moth.

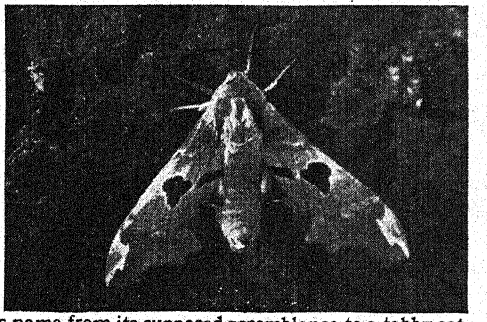






When the puss moth caterpillar is about to change into a chrysalis, it makes a cocoon by biting pieces of wood from the bark, and cementing these into a substance so hard that it will break a penknife blade. It is the same color as the bark, and difficult to find. On the left we see the chrysalis and cocoon of the puss moth. On the right are three chrysalises of the lime hawk moth, whose caterpillar is transformed underground.





On the left we see the furry puss moth, which gets its name from its supposed resemblance to a tabby cat, although its color is really black and white. On the right is the lime hawk moth, the caterpillar of which feeds on lime leaves. Its color varies, but is usually leaf-brown and green, with black spots and stripes.

The glory of the butterfly, which would betray it to enemies, is hidden by this provision of Nature. The gay wings close up over the insect's back, like the leaves of a book, and the parts of its body which are visible resemble its surroundings. Even our common cabbage butterflies are difficult to see when they settle and close their wings.

By a gradual process the handsome butterflies have made themselves, when still, like the color of the twigs or foliage on which they rest. Some of the most beautiful look just like dead leaves when they rest on a tree. But others have done a more wonderful thing. It is impossible to explain how they have done it, but some of the biggest and handsomest have made themselves like other insects known to be poisonous or in other ways distasteful to birds. These imitative butterflies may be seen flying about slowly, not at all alarmed by the presence of birds that eat butterflies.

The food of butterflies consists, as a rule, of the nectar of flowers, but there are exceptions even among the loveliest. One of the finest and largest butterflies of Europe is the Purple Emperor. He flies high among the tree-tops, and is not easy to be seen. There is a way to bring him down, however, and that is to set a bait of putrid flesh. He will come down readily enough to that, although he cannot bite it.

FAMOUS BUTTERFLIES AND A BUTTERFLY THAT FLIES THREE MILES HIGH

He has neither jaws nor teeth; those he left behind when he turned from a caterpillar into a chrysalis. He has a long sucking-tube, and with this he sucks the fluid out of the meat. The more handsome the butterfly, the more certain is it that he will like this sort of food. And he and others will drop to the ground to drink from the water of a puddle.

The finest of all our butterflies is the Swallow Tail. Other famous ones are the Red Admiral, Peacock, Tortoiseshell, Painted Lady, the Red-spotted Purple, the Common Sulphur, the Monarch, Spring Azure, Mourning Cloak, Purple Hair-streak, the Fritillaries, the Large Copper and the Cabbage butterfly, and, of course, the Purple Emperor. Specimens of several of these may be found in all temperate lands. It is surprising how far the butterfly really does go. Of course, we expect to find it in hot countries, and we do find it there, in enormous numbers—thousands of species, as large as birds, some of them, and lovely as a poet's dream. But in the frozen lands, in the short days of summer, we find butterflies; and high up mountain-sides, where it is cold and bleak, up 16,000 feet and more, there also we find butterflies. They can fly far, too. Darwin saw them out at sea in such clouds that, though he used a telescope, he could not find where the swarm began or ended.

VAST CLOUDS OF BUTTERFLIES THAT TAKE DAYS TO FLY PAST A PLACE

In Ceylon a traveler saw such a multitude of them that it took days for the whole host of them to pass.

The life-story of the moth closely resembles that of the butterfly, except that most moths prefer the night hours in which to fly. There are thousands of species of them, from the monsters called owl moths, measuring nearly a foot across the extended wings, down to the little moths which good housekeepers so fear. Most of the moths eat the same sort of food as the butterflies, and lay their eggs on plants which serve the caterpillars as food.

The clothes moth is one of the smallest of the family, and because of its bad reputation is one of the things most disliked. Let us say a good word for it. The moth does not want our *clothes*. Its purpose in life is to act as a scavenger, to eat up wool and hair and feathers discarded by animals and birds, or left by those which have died. But if we have the windows open and a light shining at night when the little moth flies from her hiding-place, she is bound to fly in—the light draws her. And once in, the moth thinks it might as well stop. So it creeps into the wardrobe, or clothes-chest, or, it may be, into the carpet or the stuffing of the furniture, even into the rugs with which we clothe the horse in the stable. There it lays its eggs and dies. The moth itself never eats clothes. It does not eat anything at all. It is the caterpillar from the egg which does the damage.

THE CATERPILLAR THAT EATS OUR CARPETS TO MAKE A HOUSE FOR ITSELF

This is a marvelous little worker. It eats wool and the fur for its meals, and it converts more wool or hair into a little house for itself. Having no shell

of its own, it makes one by chewing hair or wool and making it into a sort of silk. This case it never leaves. As it grows bigger the caterpillar splits open its case, adds a length to the end in front, and a length to the end in the rear, and spinning a new section, joins it entirely along the whole side, then seals up the case once more. When it walks it pops out its head and front legs, and draws its case with it.

The damage that it does results not only from its biting up the wool or fur for its food or for its house. Like some of the ants, it must have a straight, smooth path along which to walk, and to secure this, it bites the fur or wool quite level with its scissor-like jaws, so that its path may be plain and easy wherever it goes. Before turning into a chrysalis it spins threads which fasten its nest to the article upon which it has rested. It remains three weeks in the chrysalis case, then comes forth as a moth, lays its eggs and dies.

A LITTLE GREY MOTH THAT IS AN ENEMY OF THE BEES

The bee moth, or wax moth, is famous as an enemy of the bee-keeper, by whom it is cordially hated. This innocent-looking little grey moth creeps into the hive to lay her eggs, which hatch into ugly, grub-like white caterpillars. As soon as they are hatched, the tiny worms weave for themselves a covering of silk, and, secure in this, eat their way steadily through the wax, destroying the young bees as they go. The cocoon of the caterpillar is made of strongly woven silk, silk through which the bees cannot sting. The bee moth is hated by the bees, and if they catch one as it sneaks into the hive they fall upon it, sting it to death and tear it wing from wing.

There are several species shaped and colored just like bees and wasps. Their shape and color are a part of the great plan known as protective mimicry, by which various forms of animal life are enabled to make themselves either like other living species, or like their surroundings.

The females of some moths never use their wings. The females of the Vaporer moths, after quitting the chrysalis stage, deposit their eggs on the outside of the cocoon, while the female Psyches never leave the cocoon at all. We have a moth in our American orchards whose female has but feeble wings. It is a mercy that this is so, or we should have very little fruit. The eggs of the moth are laid in the branches of the tree, and the caterpillars are so numerous and so hungry that they can completely strip a tree of its leaves and buds. One farmer in Ohio went into his orchard at midsummer and found the fruit-trees as bare as if it were the depth of winter.

MOTHS THAT CANNOT FLY, BUT CLIMB TREES TO LAY THEIR EGGS

When the chrysalis forms it drops to the ground, and there the moth is produced. Now, as the female cannot fly, when she wants to lay her eggs she has to reach the top of the tree by climbing up the trunk. So the fruit-growers, who have learned the secret, put bands of a special sort of paper round the trunks of their trees, and on this paper they spread bird-lime or other sticky stuff. When the moth starts to climb up the tree, she is caught on this sticky band. Then, as there are no moths to lay eggs in the trees in the autumn, there are no caterpillars in the following spring to destroy the farmer's leaves and kill the trees.

We cannot protect our vegetables against the cabbage butterfly in that way. It is there that the ichneumon fly saves us. If all the eggs of the cabbage butterflies came to maturity, there would be no vegetables left in the country.

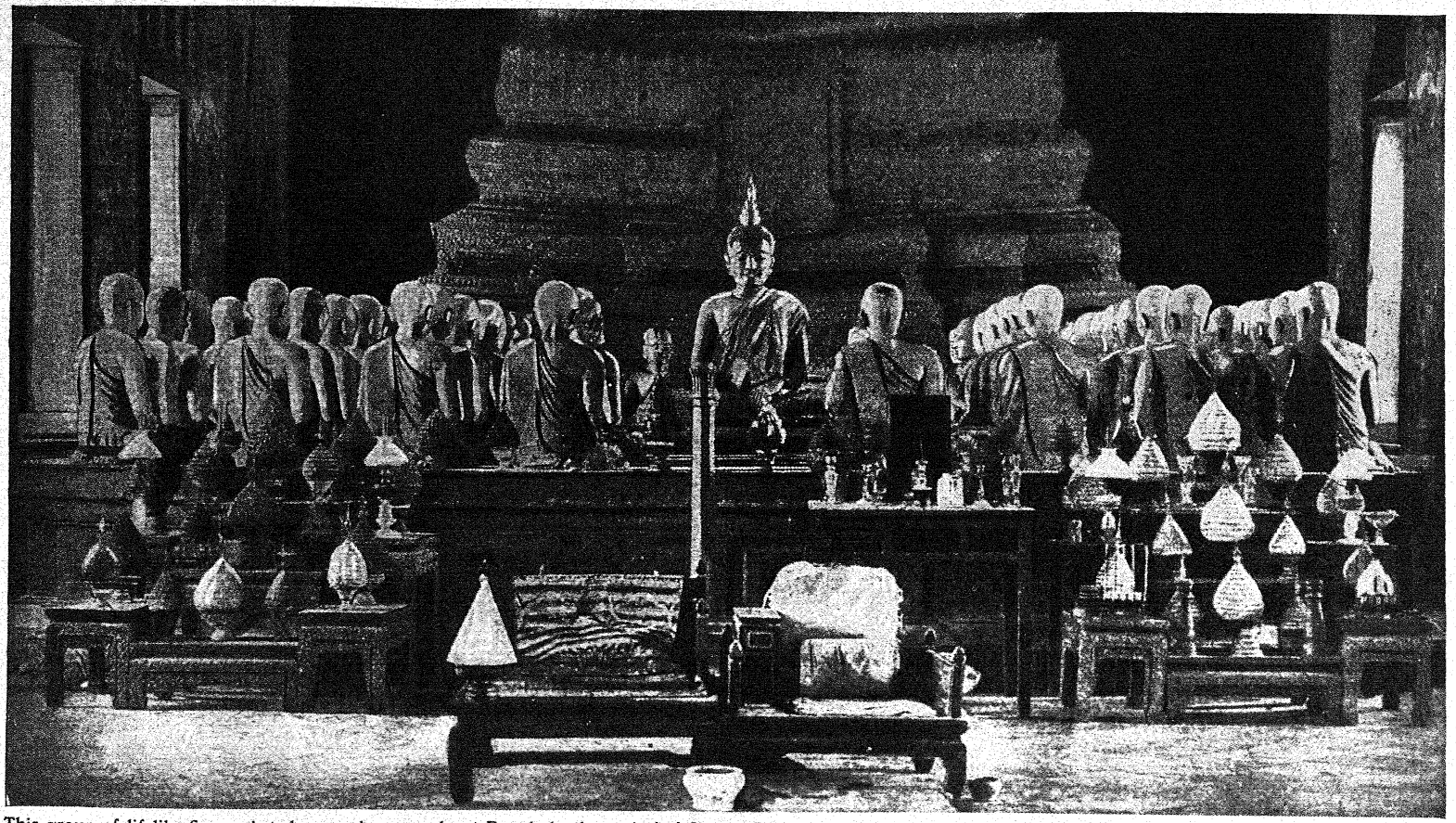
Many moths and butterflies do not live long enough to lay two lots of eggs in a year. Most of them die as soon as their eggs have been laid.

WHY WE SOMETIMES SEE BUTTERFLIES FLYING ON A COLD WINTER'S DAY

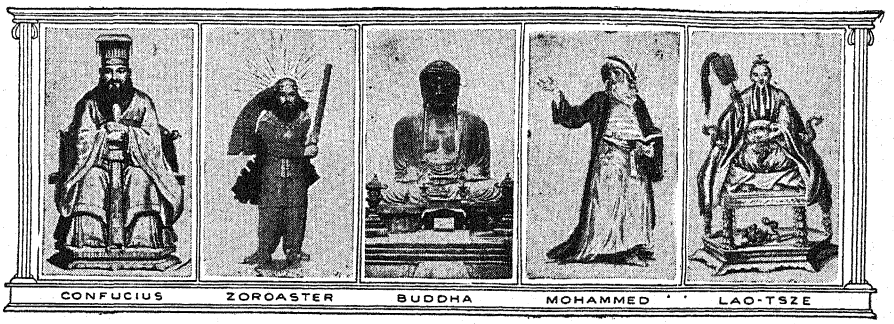
But some get into a sheltered nook before the weather turns cold, and in that condition slumber away the winter, to be awakened by the first warm, sunny day that comes. That is why, on a warm day in winter, we may sometimes see butterflies on the wing. That may happen also from chrysalises being turned, by the warm weather, into the perfect insects before their due season. For the most part, however, the egg or the chrysalis remains quiet and inactive during the winter months, and when summer comes, then come also the little-known beauties of the moths and the gay splendor of the butterflies.

THE NEXT STORY OF NATURE IS ON PAGE 3055.

BUDDHA TEACHING HIS PUPILS THE VANITY OF HUMAN DESIRE



This group of lifelike figures is to be seen in a pagoda at Bangkok, the capital of Siam. It represents Buddha, "the Enlightened One," teaching his pupils, each of whom is dressed in the robe of a Buddhist priest, and has his name on a marble tablet affixed to his statue. All pupils are sculptured life-size, while Buddha is greater than life-size.



SOME FOUNDERS OF RELIGIONS

CONTINUED FROM 2942



MAN in all ages has been puzzled to know why he exists, and how this earth came into being. Directly he began to think, he found himself surrounded by mystery. He looked around him, and saw the beauty of the fields, the majesty of the hills, the wonder of great waters; he looked upward, and fixed his gaze upon the uncountable stars; he turned his gaze inward, and saw, as it were in a mirror, himself, his own thought, his reflection of "I am I." What did it all mean? Whence? For what purpose? Whither?

Among those who wondered there were some who meditated and reflected. Their meditations led them to believe certain things. They spoke of these beliefs. If their beliefs satisfied the ideas of men, they became teachers. They spent their lives in teaching, and at their death others continued to deliver the message.

Who these earliest teachers were and what they taught we shall never know accurately. The earliest religious ideas of the human race are lost in the silence of the past. It is quite late in the history of humanity that we come upon religious teachers whom we can name, and whose teachings are more or less clear to us. But these men, it must be carefully remembered, had inherited a teaching which goes back to the remote ages of the human race. Two of the teachers whom we meet in the past were natives of India, Gautama, the founder of Buddhism, and Vardhamana, the founder of what is called Jainism. In India, philosophy, which means search after truth, deeply occupied men's minds. Life was easy there; people had much time to sit down and think; and some gave themselves up entirely to meditating on the riddle of man's existence. India may be called the cradle of religion—certainly the cradle of dreamy thoughts.

Some five hundred years before the birth of Christ, the two men of whom we have spoken were born in India. The religion of that time was Brahmanism, a loose set of ideas into which we need not inquire. The point is that Brahmanism did not satisfy either Gautama or Vardhamana.

Gautama was the son of an influential man, some say a rajah, or king. He was brought up in a palace, and the world was kept hidden from him until he married. While he lived in the palace, Brahmanism satisfied him. But, alas! his first excursion into the world shattered his beliefs. He saw a broken-down old man, then a sick person, and at last a corpse. These things seemed terrible to his soul. He felt that life was a horror. He sought to escape from it. Leaving his wife, his new-born babe, his father, his friends, his wealth, and his palace, Gautama went out into

the wilderness, alone and penniless and homeless, to think about life. He came to the conclusion that all solid and material things are useless and quite unworthy of men's affections, because they have the germ of death in them and will pass away. Nothing is worth while. Everything dies. He accepted the conclusion that man is born on this earth not once but many times, and, because each time his spirit is filled with foolish and vain desires, the great object of life should be to destroy all desire. When once a man has learned to wish for nothing, absolutely nothing, when his spirit is filled with nothing but a complete willingness to perish, then at death he passes out of the world for ever, enters something called Nirvana, which no one but an Asiatic can understand, and is blessed for ever by being for ever non-existent. He ceases to be. Gautama preached this doctrine and called himself the Buddha, which means the Enlightened One.

It is the most curious religion in the world, if it can be called a religion at all, this Buddhism of Gautama. At one moment you feel how beautiful it is; at the next you are inclined to laugh at its apparent uselessness.

THE WOMAN WHO CAME TO BUDDHA AND LEARNED THE SADNESS OF LIFE

Here is a typical story of the Buddha. A poor woman came to him one day with a dead child in her arms. She was wild with grief, and implored the Buddha to give her medicine which would heal her child. Whatever herbs he needed for this medicine she would fetch him, even if she had to go to the ends of the earth. He told her to fetch a little common mustard seed, saying that it must be brought from some house in which no son, or husband, or parent, or slave had died. The woman went away eagerly to fetch the simple mustard seed.

"Here is mustard seed," everyone said to her. But when she asked if any had died in that house, the answer was:

"Lady, the living are few, but the dead are many."

For a long time she journeyed, and then, seeing the truth of things, namely, that death is common to the race, she left her dead baby, and returned.

"Have you the seed?" asked Buddha.

"My lord," she answered, "the people tell me that the living are few, but that the dead are many."

Then the Buddha taught her the great sadness of life, and filled her with the desire no longer to exist. As a matter of fact, the whole teaching of Buddhism in regard to human life is the direct opposite of Christianity.

THE BUDDHIST WHO SEEKS NOTHING, AND THE CHRISTIAN WHO SEEKS EVERYTHING

Buddhism, filled with the melancholy of despair, says: "Nothing is worth while." Christianity, filled with the vigor of hope, shouts: "Everything is worth while." The Buddhist is careless of life and indifferent to suffering. The Christian believes that life is good, and builds hospitals to cure the sick. Buddha did not tell people to struggle, did not bid them repent, issued few rules of conduct. His whole mission was summed up in this—disgust for existence, here or anywhere. If a man felt remorse for his sins, it showed that he wanted to do better. He must want nothing at all.

Buddhism spread among the peoples of India, and at the death of Buddha it spread still more. Its progress was checked, however, among the northern peoples, who believe in opposing themselves to Nature, and refuse to resign themselves to fate. It is a purely Eastern religion, lacking altogether a universal note—it could never convert the world.

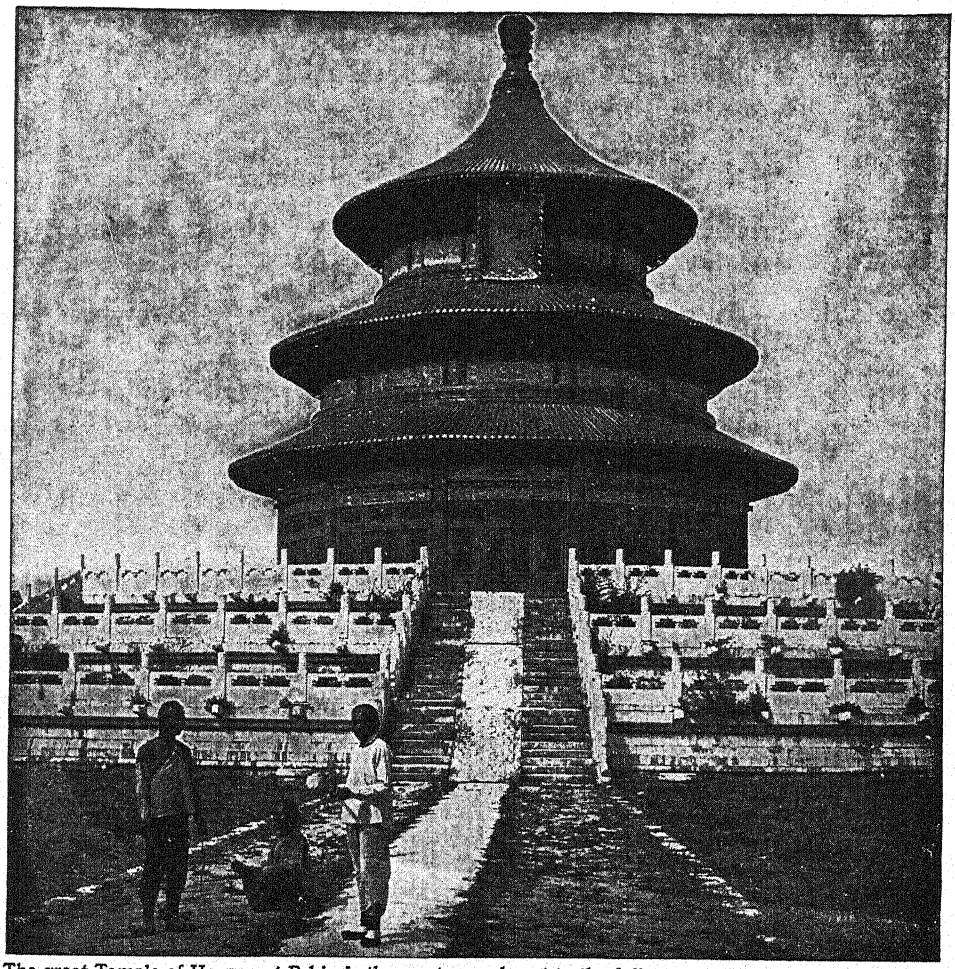
Vardhamana did not like the Buddha's teaching, and taught a very different religion. Vardhamana, we may think, was a truer teacher than the Buddha, but, unfortunately, he did not possess the same genius, the same attractiveness, as the other. His converts were fewer.

In the midst of much unintelligible stuff about Nirvana, there is a kernel of solid virtue in Vardhamana's teaching. He taught that everything has a soul, the soul being the "life"—so that grass, trees, animals, even water, have souls.

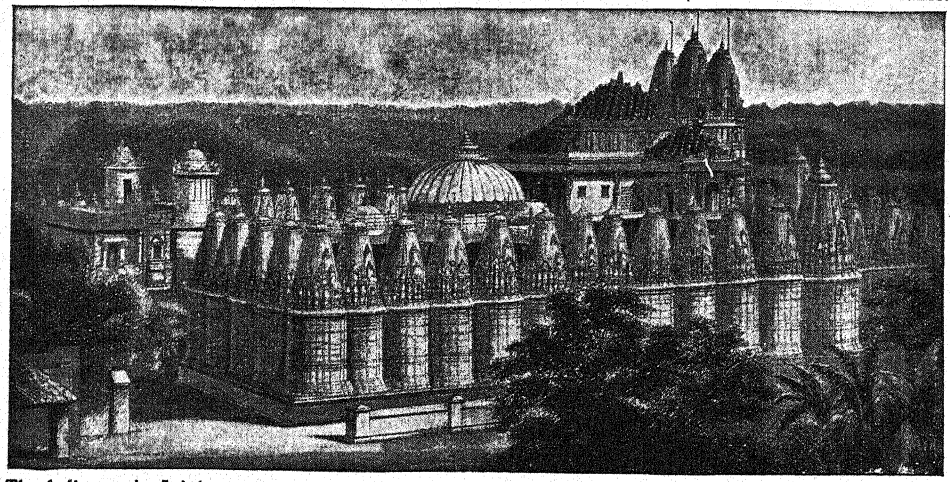
A TEACHER OF HOPE WHO FOLLOWED THE TEACHER OF DESPAIR

It is the fate of this soul to journey from body to body for millions of years, and the only escape from the toil of existence lies in practising four virtues—liberality, gentleness, piety, and repentance. One must be good in word, thought and deed; kindness to animals is essential. So we see that Jainism is better than Buddhism, because it makes for action instead of for despair

SPLENDID TEMPLES OF ANCIENT FAITHS



The great Temple of Heaven at Pekin is the most sacred spot to the followers of Confucius. There every year, on a great outdoor altar, the Chinese ruler kneels and prays for the favor of Heaven. Then sacrifices are offered, and as the ruler bows and touches the ground with his forehead, all the officials do the same.



The believers in Jainism are not numerous, but they are very wealthy and influential in India, where there are over a million of them. They have many beautiful temples, and this one at Ahmedabad is a striking example of their elaborate architecture. Jain means victorious, and refers to the victory over self.

and resignation; but the goal appears to be the same—an escape from life. Christ, on the other hand, created in men a passionate desire for life; life, and ever more life; life which fulfils itself in adoration of God, who wishes all His children to be happy.

Nothing is known of Vardhamana, but the Jains still exist, and are very rich.

A GREAT CHINESE TEACHER AND THE CURIOUS LEGEND OF HIS BIRTH

Curiously enough about a century before the existence of these two teachers in India, there lived two teachers at one and the same time in China. The one was Lao-tsze, who founded what is called Taoism; and the other Confucius, the founder of Chinese philosophy.

The meaning of the title Lao-tsze is nothing more or less than "Old Boy," and legend has it that he was born in a miraculous way, being no less than eighty years old at the time of his birth, his head being covered with white hair, and a venerable beard descending from his chin. But a more appropriate translation of "Lao-tsze" is to make it "the Venerable Philosopher"; and of course the story of his birth is simply a legend.

He was born in a hamlet, and became librarian to the king. In the royal library he pondered over the mysteries of life, and after many years he came to the conclusion that the great thing, the supreme virtue, was humility. Desiring to hide himself, he left the palace and set out for the wilderness. As he was passing through the gate, the warden, who knew him for a holy man, said:

"You are about to withdraw yourself from the world. I pray you write me a book before you go."

Lao-tsze thereupon sat down and wrote a book about half the size of St. Mark's Gospel. He gave this to the warden, passed through the gate, and no man knows where he died.

HOW LAO-TSZE WROTE A GOSPEL AND TAUGHT MEN NOT TO BE ANXIOUS

The little book is the gospel of Taoism. From those few pages grew up an immense religion. If Lao-tsze could stand in that gate now, he would be amazed to see the effect of his farewell to the warden. Let us see how much we can understand of Taoism.

The word "Tao" is the despair of translators. It means "the way," but it means "the wayfarer" as well. It is man and his destiny; God and humanity. We cannot say exactly what a Chinaman understands by it. Lao-tsze's advice is that we should think and act without reflection. We should become like young children. The grass grows without taking thought; man should live with a similar freedom from anxiety. Everything should be spontaneous, everything done on the impulse. But he carries this advice almost to the point of anarchy. "It is the way of Tao," he says, "not to act from any personal motive, to conduct affairs without feeling the trouble of them, to eat without being aware of the flavor, to account the great as small and the small as great, to recompense injury with kindness."

He hated war; he did not like to see men put to death. He felt no interest in art, culture, and refinement. Life should be without effort. There could be no beauty where there was strain. The pilgrim of existence should never be in haste about anything, never be anxious.

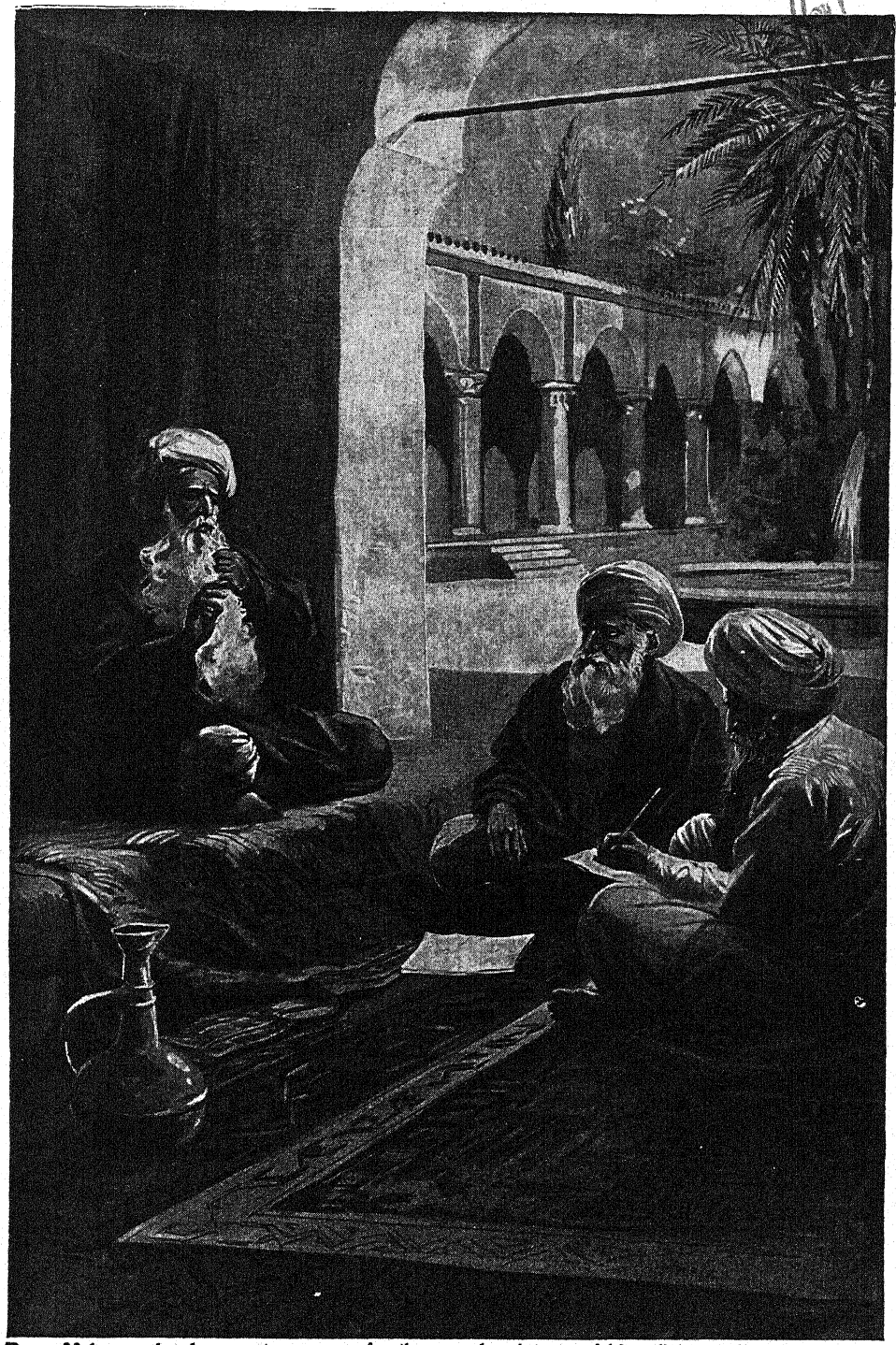
THE BOY WHO PLAYED AT PREACHING AND BECAME THE SAGE OF CHINA

We see that, unlike the two teachers of India, this old philosopher wanted people to be happy; but we cannot help feeling that here also is that despairing "fatalism," or the belief that everything is prearranged to happen, whatever man may do, which is the ruling idea of the East as distinct from the West.

A very different man is Confucius, the great sage of China. Confucius and Lao-tsze once had a conversation together. Lao-tsze did not think much of Confucius. Confucius was struck by Lao-tsze. Now, which should we say was the greater man? It was Confucius. It requires genius of the highest order to appreciate those with whom we do not agree. Confucius was born of an ancient and honorable family; but he was poor. In order to earn his living, he studied hard in childhood. He was fond of music, and played on the lute, singing to it. His favorite game with other children was what we should call "playing at being a clergyman." He liked to dress himself up, to strike attitudes, and to conduct religious sacrifices. He was married at nineteen, and became a keeper of stores, and afterwards the controller of parks and herds.

He was twenty-two when he set up

MOHAMMED DICTATING THE KORAN



Every Mohammedan has great reverence for the sacred scriptures of his religion, called the Koran, a word that means "book," just as our word Bible does. Mohammed said that the chapters of the Koran were brought to him from heaven by the angel Gabriel, and to confirm this, pointed to the fact that he himself could neither read nor write. But the general opinion of scholars is that he dictated the Koran.

The photograph of the top picture on page 3025 is by H. C. White & Co., London, and that of Buddha on page 3023 is by Frith.

as a teacher, and it is said of him that he never refused a scholar who was too poor to pay his fees. But he used to say that when he had explained one corner of any subject, if the pupil could not understand the other three corners for himself, he gave up teaching that lesson.

His fame spread as a teacher, and he became a minister to one of the rulers. So great was his success that he became "the idol of the people, and flew in songs through their mouths." He put down injustice, and banished crime. He was just, honest, fearless, and good. But the ruler began to grow jealous of his power, and Confucius had to go.

The rest of his life is a pathetic tale of homeless wanderings. Accompanied by his disciples, he journeyed from state to state, seeking some ruler wise enough to accept him as teacher and minister. He told his disciples that the greatest reform was to make people understand the meanings of such names as "ruler," "father," "son." If those words were properly understood, unhappiness and misery would vanish from the earth.

How the Teacher of China Sought a Kingdom but Found None

On these wanderings he frequently encountered hermits—men who had retired from the world in disgust. These hermits could not understand how Confucius could be so stupid as to live in a wicked world trying to alter what was unalterable. Confucius said it was impossible to withdraw from men and live with beasts and birds who did not understand man. "With whom should I associate," he asked finely, "but with suffering man?" So he walked on and on, teaching his disciples, comforting the poor, and seeking for a kingdom to rule.

He found no kingdom. But his teachings have lived from the day of those sad wanderings down to our own time, and Confucius now reigns as no other emperor can reign in the hearts of millions and millions of the human race.

One of his sayings shows the great difference between him and Lao-tsze: "The cautious seldom err." But his whole gospel was more generous than that; he taught the golden rule that we should live exactly as we would have others live: "What you do not like when done to yourself, do not to others." His whole teaching shows that we should do good to others, whether there is need for us to do so, or not. But he said nothing chivalrous or noble about women, and he gave no attention to a life after death. "While you do not know life," he said, "what can you know about death?" All his ideas of goodness concerned man's life on this earth, and it is wonderful that a teacher who left wholly out of account life after death should have had, and still does have, such immense influence over men.

The Prophet of Persia Who Laughed the Day He Was Born

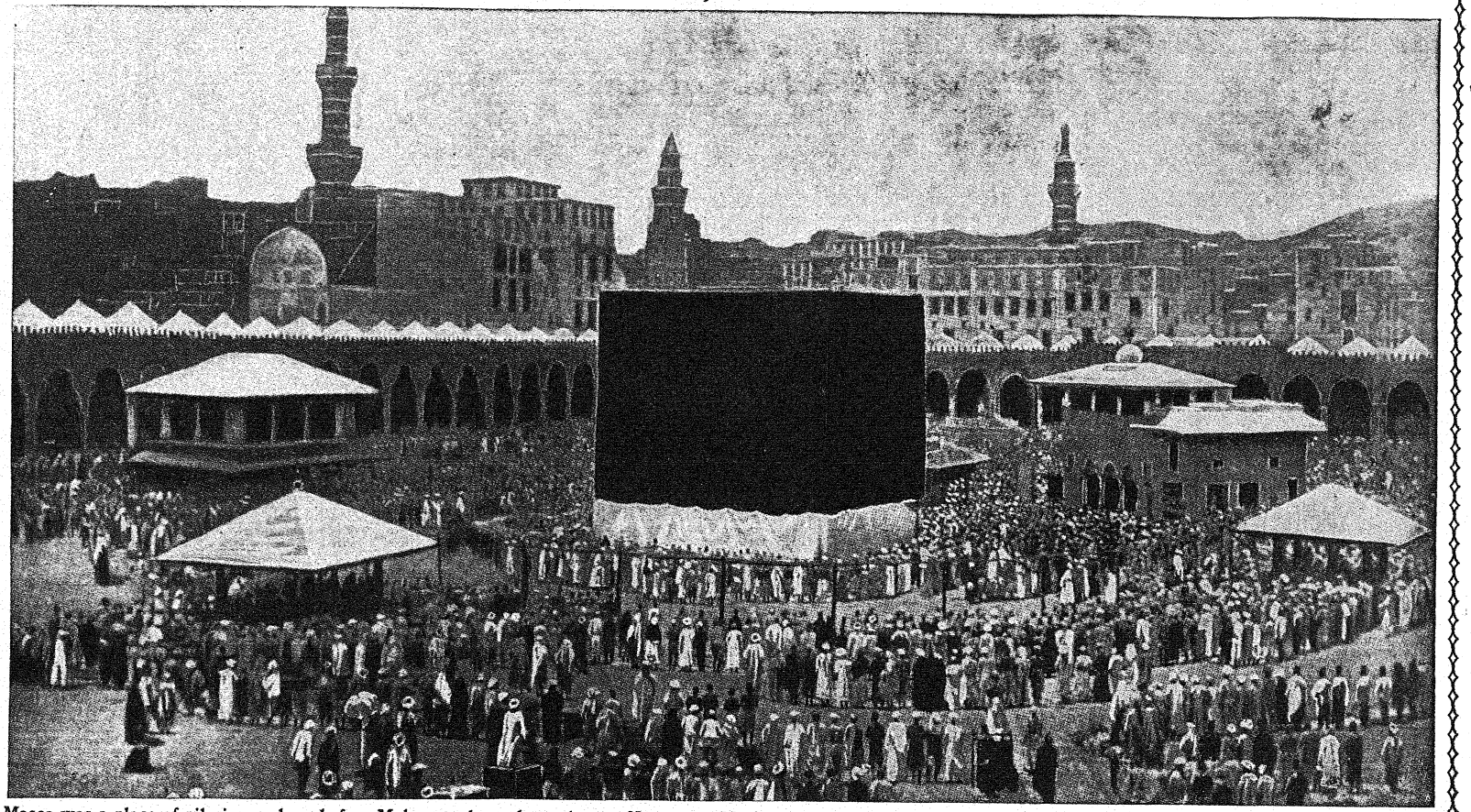
Further back in time than any of these men is the founder of Zoroastrianism, the ancient religion of Persia. Some say he lived before the battle of Troy, others that he was Ezekiel, others that he was Ham, Moses, or Abraham. There is no end to the theories about Zoroaster. The legends about him are also legion. It is said that he began to laugh the day he was born; that the palpitation of his brain was so vigorous that it repelled any hand that might be put upon his head; that he dwelt twenty years in the wilderness and lived upon a single cheese which never grew stale. It is also said that as he came down from meditation on a mountain, fire burst out from heaven which did not consume him; that he desired to be killed by a thunderbolt, and that in this manner he did die, after having taught the Persians all there is to know about this world and the next.

We need not trouble our heads about this enormous nonsense, which always grows up about the original men of antiquity. We may be certain that a man named Zoroaster did live, that he taught the Magi, or Wise Men, of Persia, and that his character was sufficiently unusual to make him revered and honored and obeyed by his disciples.

The Good God of the Light and the Evil God of the Darkness

Zoroaster divided everything into good and evil. There was a good god and an evil god. Some of the animals, birds, fishes, and plants are made by the good god, and some by the evil. He taught that sacrifices should be made to the good god in order to win from him all manner of good things; and to the evil god also, that he might guard the offerers from dangerous and hurtful and unpleasant things. Light belongs to the good god, and darkness to the bad. The name of the good god is Ormuzd, and

THE BIRTHPLACE OF MOHAMMED, WHICH EVERY MOSLEM MUST VISIT



Mecca was a place of pilgrimage long before Mohammed was born there. Now every Moslem must turn towards Mecca when he prays, and must visit it at least once in his life. In the courts of a great mosque stands the kaaba, shown in this picture, a small temple which every year receives hangings of rich material from the Sultan of Turkey. No pilgrim visits Mecca without walking round the kaaba seven times and kissing a sacred black stone, built into its wall, which Abraham is said to have received from Paradise.

the evil Ahriman. Life after death will be either good or evil, and the whole of our eternal life is determined by our existence here. The soul after death passes over the Accountant's Bridge; its deeds are examined in the book where everything is written; if there are more good than evil deeds, it goes straight to bliss; if the other, it goes straight to pain; and if the balance is equal, it waits in a land of shadow for the final decision of the Great Judge.

You will see that there is some sense and some beauty mixed up in this otherwise absurd religion, which is interesting as showing us what men have accomplished in striving to solve the great and perplexing riddle of existence.

THE ORPHAN BOY WHO BECAME A PROPHET TO MILLIONS OF MEN

And now, last of all, we come to the most recent of religious founders, Mohammed, who is the prophet to millions of the human race, and has sometimes, very ignorantly, been compared with Christ. The truth is that Mohammed probably knew the teachings of Christ. Mohammedanism, some people have said, was Mohammed's effort to rescue the teaching of Jesus from the confusion into which it had been brought by the Christian Church.

Mohammed was born of poor parents at Mecca towards the end of the sixth century. Left early an orphan, he was brought up by an uncle. He was a good boy. At a marriageable age he was sent to act as master of the camels of an elderly woman who traded in Syria. This woman fell in love with her young servant and married him. At forty years of age he was the father of a family, with married daughters. Later he had many wives, and is said to have excused himself for beating one by saying that he flogged her as a woman, not as his wife. Some authors says that he was subject to epileptic fits, and that, being ashamed of this infirmity, he pretended that he fell into convulsions because he could not support the glorious sight of the angel Gabriel, who came from God to inform him of things concerning religion.

THE FLIGHT OF MOHAMMED WHO TAUGHT THE RELIGION OF THE SWORD

In any case, he certainly had swoons; and he certainly, on account of his visions, became a feared and honored person. Disciples gathered about him. The magistrates of Mecca, fearing an insurrection, determined to put a stop to his ravings, whereupon Mohammed made his famous flight from Mecca to Medina. Here he determined to assert his religion by the sword, and, gathering an army about him, went to and fro, attacking cities and caravans on the road, until at last, after some years, Mecca itself fell into his hands. He died three years after.

It is certain that Mohammed's followers became enthusiastic in devotion to one God, Allah. It is certain that much of Mohammed's teaching is borrowed from the law of Moses. It is almost probable that his ideas were influenced by the primitive teachings of Christianity. He rejected the Church; but he seems, in his own fashion, to have accepted Jesus. But his ideas altogether lack the exquisite clearness and the transparent purity of the Light of the World. They cannot be compared.

The Koran, the scriptures of Mohammedanism, is a wonderful book. Mohammed is supposed to have been inspired by the angel Gabriel to dictate it or have it written. In it there are fables the most monstrous and horrible; but in it, too, there are occasional aspirations towards immortality, and expressions of repentance, which are beautiful.

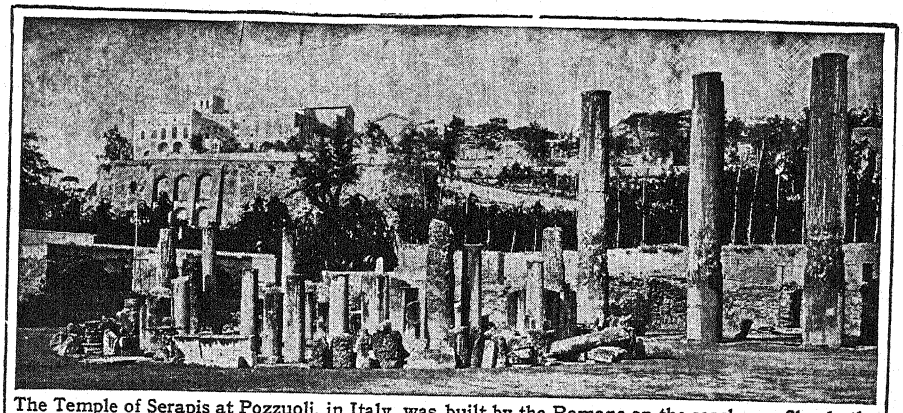
THE KORAN THAT RULES NATIONS AND PREVENTS THEIR PROGRESS

With all its faults, the Koran rules millions of the human race; but it prevents progress. On the whole, it is a book neither very profitable nor very pleasant for any but students of religions. And yet it is this book which Mohammedan children must use as almost their only school-book. Mohammedanism, youngest of all religions, is perhaps the one most distasteful to European knowledge.

The more one compares religions, the more brightly shines the pure and increasing light of the Bible; and, above all, the more we compare the founders of other religions with the pure and beautiful Christ, the more do we feel their utter unworthiness to be compared with Him.

All religions are a struggle from ignorance to knowledge, an effort of man to understand his Creator; but it is in the Bible alone that we seem to find hope.

THE NEXT MEN AND WOMEN BEGIN ON 3049.



The Temple of Serapis at Pozzuoli, in Italy, was built by the Romans on the seashore. Slowly the land sank, until at last the sea invaded the temple, and marine creatures burrowed into the stone pillars. About 350 years ago the land again began to rise, and now the temple is above the water.

THE EARTH'S CHANGING FACE

CONTINUED FROM 2920

WE have begun to learn something about the forces that have long been at work shaping the face of the earth, and we have made the very great discovery that those forces are at work still. When we read what is ordinarily called history, we make the greatest of all mistakes if we fancy that what men did, or said, hundreds of years ago, must be more important than what they are doing and saying now; and so in the history of the earth's face, the present is as important as the past, and the history of the future is now being made by tides and rivers, and rain and wind, just as the future history of mankind is being made by us.

What, then, do we find when we look at the face of the earth as it is at present? For the first answer to this we turn to our maps. As a rule we do not think that there is anything particularly wonderful about a map, but there is a great deal of human history of almost the highest kind printed upon a map, even a map that has no names upon it, and that is all printed in one color. For ages past brave men, who have had a special genius for travel and adventure, have started out from home to search the earth. None of us, even by much thinking, can quite realize the courage and the faith of a Columbus, setting forth on untracked waters to find an unknown land. Thousands of brave lives, much thought, and wisdom, and patience, and faith have gone to the gaining of the knowledge which is expressed in a globe or in a map of the world. Those of us who stay at home, and take good care of ourselves, ought to remember this when we open an atlas.

Now, we are not going to consider here all the different colors which we see on an ordinary map of the world. Maps published in England, for instance, show much red, and we learn that red indicates the territory for which they who live in those little islands are responsible, and when we see how much of the world is so marked, we are forced to think what a solemn thing it is to be charged with such a responsibility.

There are other colors besides red, and we know that these colors stand for different countries, and the line between one color, or country, and another is called a frontier. Now, one of the first things that we learn, when we study real knowledge, is that for science of the highest kind there

are no frontiers, and that these different colors in which our maps are printed do not mean everything for anyone who tries to do the highest kind of thinking. A great man, who traveled all over the world, once said: "I have traveled all over the world, and I have found only two kinds of people, men and women." We might add that if we travel all over the world, we find only one thing everywhere, and that is Nature. The laws of motion, and of light, and of chemistry, the laws of water and of air are true everywhere, and the earth is a whole, which we must always think of as a whole; just as mankind is a whole, and to be thought of as the child of the earth, even though we sometimes think of ourselves as a number of foolish little groups of people, hating and fighting each other.

Now, the first thing we discover is that the face of the earth is partly covered by water and is partly dry land. We know that about two-sevenths is dry land, and about five-sevenths water. The great masses of dry land we call continents, and the great masses of water we call the oceans.

THE GREAT MOUNTAIN PEAKS THAT RISE OUT OF THE SEA

There is land at the bottom of the oceans, and where this land rises high enough, as, for instance, in a sort of mountain range, we may find the peaks of the mountains coming up above the surface of the water, and forming a chain of islands. On the other hand, even in the middle of the continents, we may find deep places which are covered with water, as, for instance, in the great lakes of North America or the Caspian Sea in Asia. This distribution of land and water on the surface of the globe, we have lately learned, is constantly changing. There is no end to the evidence that proves this.

When we look at a map of the world and see the continents and the oceans, we must understand that what we are looking at is a map of the world as it happens to be now; that our lives, or the whole period of written history, are but moments in the history of the earth, just as the whole history of the earth is but a moment in the history of the universe. We are gradually beginning to find out how it might be possible to make quite a different map, showing what the face of the earth was like, perhaps a million years, or five million years, ago; and we may even begin to learn something of what the face of the earth will look like in a million years to come. It is probable that, on the whole, the surface of the earth from age to age is becoming drier.

HOW THE EARTH IS DRYING UP AND BECOMING LIKE THE PLANET MARS

New water is being made on the earth; but more is being lost, for as a planet like the earth grows older, more and more of the water sinks through its crust, and leaves the surface. When we make a careful study of the planet Mars, which probably has yet a great deal more to teach us about our own earth than we have learned already, we believe that Mars shows us what the earth may one day become, and probably the moon teaches us the same lesson. The whole surface of Mars is now very nearly, though not quite, dry. There is not much water upon it except at its Poles.

But though this is probably true of the earth as a whole, and though there was probably never more dry land on the earth than there is now, yet there may have been areas of dry land once, in places where now the ocean rolls; while, on the other hand, great stretches of the present continents must have been under the water. We have some evidence of a lost continent which is specially interesting because it has to do with the history of our own distant ancestors.

When we look at a map of the world, we see running down from India, along the coast of Siam and the Malay Peninsula, a great chain of islands, which leads to Australia, the biggest island of them all. This great island is so big that it is really a continent, though, of course, it is not so big as the continent of Africa, which man has made into a great island by cutting the Suez Canal.

A MIGHTY CONTINENT THAT LIES LOST AT THE BOTTOM OF THE SEA

When we study Australia and the islands which lie between it and Southern Asia, we begin to learn that very probably there was once a great continent there, and that all these islands, smaller and larger, really represent the highest parts of that lost continent. When, too, we study the kinds of life that are to be found in Australia and these islands, we are more sure than ever that they must

have begun to develop on a single great continent, and when we examine still more closely the peculiarities of the living creatures in Australia itself, we can even begin to calculate how long ago it was that Australia was made into an island and cut off from the rest of the world. Of course, as we read this, we shall keep a map of the world before us. Now, in the northern part of this vast district—as, for instance, in the islands of Sumatra and Borneo—we find some wonderful kinds of monkeys, of which we may see living specimens at the zoological gardens in cities any day. These, we can prove, are more like primitive man in form than any other living creatures in the world. So it is possible that, long ages ago, the very first of mankind lived on this lost continent, and that there mankind first saw the light.

Thus we come to the first of the great questions which face us, directly we realize that the land and water of the earth are always more or less changing places. What are the forces which lower a continent so that part of it becomes the bed of the ocean, and what are the forces that can raise the shallower part of an ocean so that it becomes a continent? There are no more important questions for this branch of knowledge, and I fear that there are scarcely any more difficult to answer.

THE MYSTERY OF THE RISING AND THE FALLING OF THE OCEAN FLOOR

If we were merely to ask what it is that is eating away, for instance, parts of the east coast of America, then there would be no difficulty, for we can see the process going on under our own eyes, and we see that wind and water account for it. But if we are to discover what happens to make the loss of a whole continent, it is evident that we require some deeper explanation than this kind of thing. Deeper is exactly the word, for it is quite evident that nothing acting on, and at, the surface of the earth could produce such tremendous results. The surface forces of wind, rain, air, and water can, after all, only affect the surface. It is quite plain that they could not possibly raise the bottom of the ocean so that it became dry land, nor push down a whole continent so that the ocean rolled over it. We must find some forces that act at a deeper level. Now, we know quite well that if we constantly shovel rubbish into a deep space, in time we shall fill it up. It might be that the floor of the ocean was gradually heaped up with something from age to age until at last it came to the surface; and we know that the floor of the ocean does get heaped up by the remains of living creatures, and that the same matter that makes the chalk cliffs of the English Channel is being heaped up at the bottom of the Atlantic.

THE SEE-SAW OF THE EARTH'S CRUST THAT GOES ON FROM AGE TO AGE

But the average depth of the ocean is two and a half miles, and it is quite certain that it is not this process which accounts for the making of continents from the ocean floor. It is not that anything is heaped on the floor, but that the shallower part of the floor itself is raised up. Besides, if this were the explanation, it would still leave us unable to account for the other thing that happens—the sinking of the continents. The more we come to study this question, the more we see that the real explanation, whatever it be, must be one that explains both processes. Something goes on from age to age which at one place raises the level of the earth's surface, and at another place lowers it.

It is a kind of see-saw process. Water, of course, being fluid and able to run, and being pulled by the attraction of the earth, always goes as near the centre of the earth as it can; so if the level of the solid crust falls low enough at any place, the water runs there; and if, on the other hand, the level is raised, the water runs off it. Therefore, the presence of the water, which we call the ocean, simply marks the deeper places as compared with the higher places of the earth's surface. What we need to do to get a real understanding of the question is to try to get an idea of what the earth's surface would be like if all the water were taken away. Then we could understand its real shape, its ups and downs, its depths and heights.

THE CHANGES IN THE EARTH'S CRUST AND THE UNSEEN FORCES THAT CAUSE THEM

What is it that makes the deep places deep, the high places high, and that sometimes raises the first and lowers the second? This is a far better and truer way of looking at the question

than we can get if we have the presence of the water always in our minds. At once we learn that what we are studying is really the shape of the solid earth and the reasons which produce that shape and change it from age to age. The second great thing we learn is that the causes of all these tremendous changes that show on the surface are at work underneath the surface. The surface means a lot to us. All life is its child. But, after all, if we could drain all the water away, we should find that the outside of the earth is merely a thin crust, probably not more than forty or forty-five miles thick at the most; and the movements of this crust up and down—which have such tremendous consequences, throwing the water outside it from one place to another, turning oceans into continents and continents into oceans—are due to the gigantic forces that are ever at work in the earth's interior. That is what we mean when we say that we must find a deeper explanation of these surface changes. At last we have got deep enough.

WHAT WOULD HAPPEN IF THE EARTH WERE QUITE ROUND LIKE A BALL

Now, first of all as to what is the real shape of the solid earth at the present time. What would it look like if we could dry it—run all the water off it, so to speak, and hold it in our hands? For instance, would it be round, like a ball? We may be perfectly certain that it would not. If it were round, like a ball, the water would cover it equally all over; the whole surface of the earth would be one waving ocean, and life would have had to develop, as far as it could, either under the water, or floating on the surface of it. We have already learned that life could not have advanced far on such an ocean-covered earth.

Then what is the shape of the solid earth if it is not round? Perhaps a map of the world or a globe will teach us something. When we look at such a map, almost the first thing that must strike us is that by far the greater part of the land is to the north, and that by far the greater part of the water is to the south. Now, that is very interesting and peculiar. There is no reason why we should have expected it, and probably it must mean something. There is such a thing as chance, which has its own proper laws; but the laws of chance would not account for the peculiar distribution of land and water on the earth at present, any more than they would account for the remarkable number of spiral nebulæ in the sky.

HOW THE CONTINENTS AND COUNTRIES OF THE WORLD TAPER OFF TO THE SOUTH

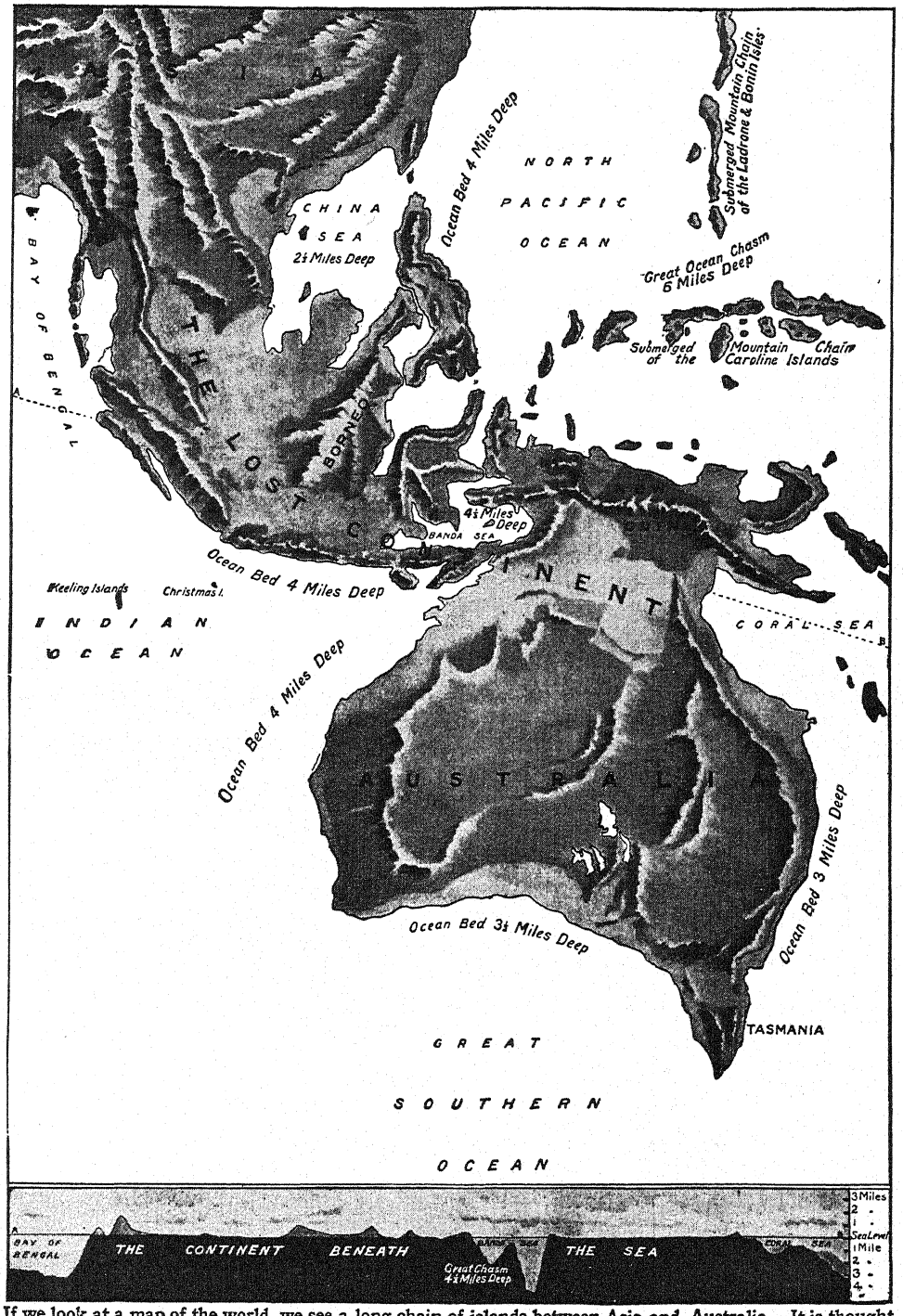
And then we notice another thing. It is that, in general, when the land does run down into the south, it gets narrower as it runs down. We see this almost everywhere. Always there is this tendency for the land to run down in tongues to the south. Look at the shape of Greenland and of South America; look at the shape of Africa; look at the shape of India; even look at the shape of Asia, and the lost continent that ends in Australia as seen in the map on page 3035. We see that it gets narrower as we go south. And if we imagine Tasmania joined to Australia, as it once was, we see that Australia itself runs southward almost to a point. Here is something which must have a meaning.

This deeply interesting and important study is now being carried on by men in different continents, and they are really as yet only in the middle of their work; but it is so important, and will certainly be so much more important, that I am quite certain we ought to understand it as far as it has gone, though we shall not find very much about it in any books in English, or in any other language. These students have made various imaginary maps and models of the earth, showing what the shape of the land would look like, and how it would be distributed, if the level of the ocean were different from what it is at present, say, a quarter of a mile deeper, and so on. They are able to do this because nowadays the bottom of the sea has been very largely mapped out over the greater part of the world, and we know where it is deep and where it is shallow, and what parts would appear above the surface if the water were drained to different levels.

THE SHAPE OF THE EARTH, WHICH IS LIKE A BIG PEAR AND NOT LIKE A BALL

All this work, which is exceedingly difficult, and has taken many years already, inclines us to the belief which we might have begun to guess at directly we saw how much water there was to the south, and how much land to the north, namely, the belief that the solid

A CONTINENT THAT HAS SUNK FROM SIGHT



If we look at a map of the world, we see a long chain of islands between Asia and Australia. It is thought that millions of years ago all this land was joined together and formed a mighty continent; but the land gradually sank and the sea rushed in, so that only the mountains remained above the water, and now form the islands of the Pacific. If the sea were to sink only 400 yards, the lost continent, which is shown restored in this map, would reappear. Very deep water surrounds the continent on all sides, as may be seen in the lower picture, which shows a section of the lost continent across the line from A to B on the map.

earth is roughly pear-shaped, with the most bulgy part inclined rather to the north, and the tapering part inclined rather to the south. We must not imagine that the pear runs exactly north and south, nor are we to think of it as at all a perfectly regular pear; but, all the same, this theory of a "pear-shaped earth" almost certainly represents a great advance in our knowledge of the earth's history, and even its future. It is not possible, except for those who have devoted years to mathematical studies, to explain the supposed causes which have produced this pear-shape. At any rate, we are to think of the great oceans as clothing this pear in such a way that, when they are added to it, it becomes a fairly regular round ball.

Working away all the time, and never to be forgotten, are the mighty forces under the earth's crust. It is these which, if we really understood them, as we have scarcely yet begun to do, would explain to us why the level of the surface heaves up and down. We could not understand this if the crust of the earth were made of the same substances everywhere, and were of the same thickness everywhere, and if the solid earth itself were perfectly round.

How the Earth's Interior Shrinks and the Crust Wrinkles into Mountains

Then the results of what is happening inside the earth, which is that it is shrinking, would show themselves equally everywhere. But the crust of the earth is not made of the same materials everywhere. It is probably very much thinner in some places than in others; and, being pear-shaped, the strength of gravitation is different at different places. All these reasons help us to understand why, as the interior shrinks, the earth's crust does not slowly settle down upon it in all directions, and why the crust gets wrinkled into mountains, gets cracked, tilted and twisted, crushed and stretched, and is even heaved up and down from age to age.

One of the greatest pieces of work for the future of science is to understand what is really happening inside the earth, and to find out what is really the structure and composition of the earth's crust. Until this is done, the study of geology is, after all, only a study of little things on the surface. It is as if we were to try to understand the history and the life and the movements of a human being by looking simply at the outside of him with all his clothes on.

A Hole that would take a Century to Dig and cost Millions of Dollars

It has been reckoned that in less than a century, if mankind worked very hard, and spent several hundreds of millions of dollars, we might make a hole in the earth perhaps ten miles deep. Even that is only a guess, because no one knows what we should come to before we had got half as far, or even a third as far. We might get a supply of steam, but even then we could learn very little; and to descend such a hole would be certain death.

The really marvelous thing is that men of science are able to learn as much as they do within the narrow and strict conditions that confine them. It is a marvelous thing that we should know the very weight and properties of the atoms in a star that is billions of miles away, and no wise person will venture to declare that we shall never learn the great facts about the inside of our own earth. New ways of learning are open to us as the generations go on. Only within the last few years we have discovered radium and what it does. We have now detected it in the crust of the earth; we have reckoned the proportion of it, to some extent, in the various things that compose, at any rate, the outside of the crust of the earth, and we are just beginning to understand how this element, by its never-ending production of heat and electrical forces, must be at work, changing and shaping the earth's crust from age to age.

How the Ground Rises and Falls Twice a Day Everywhere

Still more recently French and German scientists have declared their discovery of tides in the earth's crust. They tell us that twice every twenty-four hours the solid crust rises and falls as much as eight inches, but, of course, we do not notice this any more than sailors in a ship feel the tides of the sea.

These are the deepest and most difficult questions, though also the most important. We shall next go on to study other matters which are nearer the surface upon which we live, and which, therefore, we are more easily able to understand.

THE NEXT PART OF THIS IS ON PAGE 3125.

AN AMERICAN GIRL'S FAMOUS POEM

EVERY boy and girl is familiar with some lines of this poem. It describes, with great dramatic effect, how a young Englishwoman sought to save her sweetheart, by preventing the curfew bell from tolling, that being the signal for his death. The curfew, or evening bell, originated after the Norman Conquest, and was first intended as a warning to the Saxon peasantry to put lights out in their houses. "Curfew" comes from two French words, "couvre feu," meaning "cover the fire." This poem has so long been one of the most popular dramatic pieces in the English language, that it may be a surprise to many to know its writer is still alive, and likely, we hope, to live for many years. Her name is Rose Hartwick Thorpe, and she was born in the State of Indiana, July 18, 1850. She wrote the poem when little more than a schoolgirl, and it would not be wrong to describe it as a schoolgirl's masterpiece. It is usually known as "Curfew Must Not Ring To-night."

THE CURFEW BELL

CONTINUED FROM 2935

ENGLAND'S sun was slowly setting o'er the hill-tops far away,
Filling all the land with beauty at the close of one sad day;
And its last rays kissed the forehead of a man and maiden fair,
He with steps so slow and weary, she with sunny floating hair;
He with bowed head, sad and thoughtful; she, with lips all cold and white,
Struggled to keep back the murmur: "Curfew must not ring to-night!"

"Sexton," Bessie's white lips faltered, pointing to the prison old,
With its walls so tall and gloomy, moss-grown walls, dark, damp, and cold,
"I've a lover in that prison, doomed this very night to die
At the ringing of the curfew, and no earthly help is nigh.
Cromwell will not come till sunset." And her lips grew strangely white
As she spoke in husky whispers: "Curfew must not ring to-night!"

"Bessie," calmly spoke the sexton (every word pierced her young heart
Like a gleaming death-winged arrow, like a deadly poisoned dart),
"Long, long years I've rung the curfew from that gloomy shadowed tower;
Every evening, just at sunset, it has tolled the twilight hour.
I have done my duty ever, tried to do it just and right;
Now I'm old, I will not miss it. Curfew bell must ring to-night!"

Wild her eyes and pale her features, stern and white her thoughtful brow;
And within her heart's deep centre Bessie made a solemn vow.
She had listened while the judges read, without a tear or sigh:
"At the ringing of the curfew Basil Underwood must die."
And her breath came fast and faster, and her eyes grew large and bright;
One low murmur, faintly spoken: "Curfew must not ring to-night!"

She with quick step bounded forward, sprang within the old church door;
Left the old man coming slowly, paths he'd trod so oft before.
Not one moment paused the maiden, but, with cheek and brow aglow,
Staggered up the gloomy tower, where the bell swung to and fro;
Then she climbed the slimy ladder, on which fell no ray of light,
Upward still, her pale lips saying: "Curfew shall not ring to-night!"

She has reached the topmost ladder; o'er her hangs the great, dark bell;
Awful is the gloom beneath her, like the pathway down to hell.
See! the ponderous tongue is swinging; 'tis the hour of curfew now,
And the sight has chilled her bosom, stopped her breath, and paled her brow.
Shall she let it ring? No, never! Her eyes flash with sudden light,
As she springs, and grasps it firmly: "Curfew shall not ring to-night!"

Out she swung—far out. The city seemed a speck of light below,
There 'twixt heaven and earth suspended, as the bell swung to and fro.
And the sexton at the bell-rope, old and deaf, heard not the bell,
Sadly thought that twilight curfew rang young Basil's funeral knell.
Still the maiden, clinging firmly, quivering lip and fair face white,
Stilled her frightened heart's wild beating: "Curfew shall not ring to-night!"

It was o'er; the bell ceased swaying; and the maiden stepped once more
Firmly on the damp old ladder, where, for hundred years before,
Human foot had not been planted; but the brave deed she had done
Should be told long ages after. As the rays of setting sun
Light the sky with golden beauty, aged sires, with heads of white,
Tell the children why the curfew did not ring that one sad night.

O'er the distant hills comes Cromwell. Bessie
sees him; and her brow
Lately white with sickening horror, has no
anxious traces now.
At his feet she tells her story, shows her hands
all bruised and torn;
And her sweet young face, still haggard with
the anguish it had worn,
Touched his heart with sudden pity, lit his eyes
with misty light.
"Go! Your lover lives!" cried Cromwell.
"Curfew shall not ring to-night!"

Wide they flung the massive portals, led the
prisoner forth to die,
All his bright young life before him. 'Neath
the darkening English sky
Bessie came, with flying footsteps, eyes aglow
with love-light sweet;
Kneeling on the turf beside him, laid his pardon
at his feet.
In his brave, strong arms he clasped her, kissed
the face upturned and white,
Whispered: "Darling, you have saved me;
curfew will not ring to-night!"

OH, LOOK AT THE MOON!

These simple child-like verses were written by an American lady, named Eliza Lee Follen, about seventy years ago. Mrs. Follen was born in 1787 and died in 1860; she wrote many similar old-fashioned pieces, chiefly for young people.

OH, look at the moon!
She is shining up there;
Oh, mother, she looks
Like a lamp in the air.

Last week she was smaller,
And shaped like a bow;
But now she's grown bigger,
And round as an O.

Pretty moon, pretty moon,
How you shine on the door,
And make it all bright
On my nursery floor!

You shine on my playthings,
And show me their place,
And I love to look up
At your pretty bright face.

And there is a star
Close by you, and may be
That small, twinkling star
Is your little baby.

MINE HOST OF THE "GOLDEN APPLE"

It is a very old custom for inns and public-houses to adopt some sign to distinguish them. The "Red Lion," the "Green Man," the "Bunch of Grapes," and such like are familiar. The "Golden Apple" has also been so used, but here a poet reminds us that the place where Nature's apples grow is better than that with the painted sign of the "Golden Apple." The verses are by Thomas Westwood.

A GOODLY host one day was mine,
A Golden Apple his only sign,
That hung from a long branch, ripe and fine.

My host was the beautiful apple-tree;
He gave me shelter and nourished me
With the best of fare, all fresh and free.

And light-winged guests came not a few,
To his leafy inn, and sipped the dew,
And sang their best songs ere they flew.

I slept at night on a downy bed
Of moss, and my host benignly spread
His own cool shadow over my head.

When I asked what reckoning there might
be,
He shook his broad boughs cheerily:
A blessing be thine, green apple-tree!

ROCK OF AGES

This beautiful hymn was written by Augustus Montague Toplady. It is found in many church hymnals, and has become familiar and dear to the hearts of many of us.

ROCK of Ages, cleft for me,
Let me hide myself in Thee.
Let the water and the blood,
From Thy riven side which flowed,
Be of sin the double cure—
Cleanse me from its guilt and power.

Nothing in my hand I bring—
Simply to Thy cross I cling;
Naked come to Thee for dress—
Helpless look to Thee for grace;
Foul, I to the Fountain fly—
Wash me, Saviour, or I die.

While I draw this fleeting breath,
When my eye-strings break in death,
When I soar to worlds unknown,
See Thee on Thy judgment-throne,
Rock of Ages, cleft for me,
Let me hide myself in Thee.

A PRAYER

LORD, who art merciful as well as just,
Incline thine ear to me, a child to dust.
Not what I would, O Lord, I offer Thee,
Alas! but what I can.
Father Almighty, who hast made me man,
And bade me look to heaven, for Thou there,
Accept my sacrifice and humble prayer.
Four things which are not in Thy treasury
I lay before Thee, Lord, with this petition:
My nothingness, my wants,
My sins, and my contrition.

ROBERT SOUTHEY.

"WELCOME TO SPRING"

This beautiful poem, which breathes the very spirit of spring, was written by Pierre de Ronsard, one of the great French poets of the sixteenth century. He was intended for the diplomatic service of his country, and was sent on more than one mission, but his career in this direction was cut short in early life by deafness. Far from being discouraged, however, he set himself to study and write. In spite of constant ill-health, he became the head of a group of poets called "the pleiades," who did much to give French literature the standard it has since upheld.

GOD shield ye, heralds of the spring,
Ye faithful swallows fleet of wing,
Hoops, cuckoos, nightingales,
Turtles and every wilder bird,
That make your hundred chirpings heard
Through the green woods and dales.

God shield ye, bright embroidered train
Of butterflies, that, on the plain,
Of each sweet herblet sip;
And ye new swarm of bees that go
Where the pink flowers and yellow grow
To kiss them with your lip.

A hundred thousand times I call—
A hearty welcome on ye all:
This season how I love!
This merry din on every shore,
For wind and storms, whose sullen roar
Forbade my steps to rove.

GERMAN FOLK-SONGS IN ENGLISH VERSE

FOLK-SONGS are simple songs made by the folk, or people, for the most part, long ago. Compared with the music of to-day, folk-songs are like wild flowers beside garden flowers. Every nation has its folk-songs; on this page and the next appears a selection from the German, translated into English by Mr. Alfred Percival Graves, M.A., an English school inspector, also famous as an author and song-writer, his merry Irish song about "Father O'Flynn" being popular all the world over. The words of these German folk-songs are simple and clear, and the tunes are easy to remember, with a good lilt about them. They are taught to German children at school, and the children grow so fond of them that they remember them all through their lives, singing them in their homes in the evenings, or in the open air when holidaying, or even when on the march as soldiers. We used to sing such songs in America long ago, and we are beginning to sing them again at our schools and concerts.

WERE I A BIRDIE TOO

WERE I a birdie too, I'd fly away with you
Far o'er the foam;
But since that cannot be, but since that cannot be,
I'll stay at home.

Still in the autumn light, valley and wood and height
Joyfully glow;
Free o'er the mountain-side still I can wander wide,
While the winds blow.

Then you, dear birdie, fly far, far across the sky;
I must bide here.
But with the spring come back, but with the spring come back,
Do, birdie, dear!

THE SONG OF THE TWO HARES

'TWIXT a hill and hollow, hollow pass,
Two young hares were lying;
Nibbling at the juicy, juicy grass,
Nibbling at the juicy, juicy grass,
How the blades went flying!

When they'd both their little paunches filled,
Down they did squat them;
Then, as in sleep they both were stilled,
Then, as in sleep they both were stilled,
Came a churl and shot them!

When they both had pulled themselves together,
And at last concluded
That they still were sitting on the heather,
That they still were sitting on the heather,
Down the hill they scooted!

THE DANCE OF THE FLOWERS

THE lilies of the valley chime
Their joy-bells sweet and low.
Now, wild flowers, 'tis your dancing time!
What makes you dally so?

Blue, yellow, white, they hurry up,
They're flocking faster still!
The daisy and the buttercup,
Wood-violet, daffodil.

Then O, while out of heaven the moon
Looks down with joyful glance,
The lilies ring and ring the tune,
The blossoms dance and dance.

Jack Frost he stamps his iron foot;
"How dare you dance and play?"
The lily-bells, alas! are mute,
The blossoms hide away.

But hardly has that churl of churls
Forsook their favourite glen,
When hark! the lilies' peal of pearls
Is wakening once again.

I hear myself its silver hum;
At home how can I stay?
O flowers, 'tis calling me to come
And dance with you away!

SON OF MY HEART

SLEEP, sonny darling, your mother's delight!
Close your blue eyes up, there, close them up quite!
Everything's quiet all over the house—
Nothing is stirring but one nibbling mouse.

Angels as lovely, my laddie, as you,
Nodding and smiling, are watching us, too;
When you are older, perhaps they will fly,
And wipe the big tear-drop from out of your eye.

Gilded by sunbeams now all your days go;
Later, ah, later it will not be so!
Then, without number, Care's shadowy hand
Will keep away slumber as by you they stand.

Sleep, my heart's darling, the dark night is nigh,
Sleep on in safety, for mother is by.
Nay, never fear you, my own curly-pate,
Mother is near you, both early and late.

GOD ONLY KNOWS

COULD you count the bright stars peeping
Through the sky so soft and blue,
Or the cloudlets gently creeping,
Tell me, could you count them too?
Only God, who never slumbers,
In His head could hold their numbers,
For He made them every one.

Could you count the midges dancing
On the golden summer beam,
Or the little fishes glancing
Up and down the crystal stream?
God has called them into being,
All their happy hours foreseeing—
That is why they frolic so!

Children, could you count the number
Of the little curly heads,
Starting out of rosy slumber
From their happy little beds?
God the Father sees and knows them,
All His loving kindness shows them—
Knows and loves you every one!

THE HOBBY-HORSE

HOP, hop, hop !
Without stay or stop ;
Over walls and fences flying,
Never jibbing, never shying.
Without stay or stop,
See my pony hop.
Tip, tip, toff !
Don't you shake me off !
Just you stop that mad curvetting,
Or the whip you'll soon be getting !
Do not shake me off !
Tipty, tipty, toff !
Ho, there, ho !
Woa, my pony, woa !
Ostler, ostler, Jinny, Joany,
Fetch the fodder for my pony !
Woa, my pony, woa !
Ho there, ho there, ho !
Whack, whack, whack !
How my whip I crack !
Wish that they would listen to me—
Yes, I think that that will do me.
How my whip I crack !
Whack, and whack, and whack !
Stay, now stay !
Don't you run away !
For the journey still before you,
Hay and oats will quite restore you.
Don't you run away !
Stay, my pony, stay !

THE FIR-TREE

O FIR-TREE fine, O fir-tree fine,
How faithfully you flourish !
Not only in the summer's glow,
But through the winter's scourging snow,
O fir-tree fine, O fir-tree fine,
How faithfully you flourish !
O fir-tree fine, O fir-tree fine,
What joy, what joy you've brought me !
When year by year your branches green,
My childhood's Christmas-trees have been,
O fir-tree fine, O fir-tree fine,
What joy, what joy you've brought me !
O fir-tree fine, O fir-tree fine,
From you I've learned the lesson :
That hope and trust through trial keen,
Still keep our courage ever green.
O fir-tree fine, O fir-tree fine,
From you I've learned that lesson !

LADYBIRD, FLY

Words by ALFRED P. GRAVES. Music by permission of MESSRS. SCHOTT & CO.



LITTLE VERSES FOR VERY LITTLE PEOPLE

IN marble walls as white as milk,
Lined with a skin as soft as silk,
Within a fountain crystal clear,
A golden apple doth appear.
No doors there are to this strong-hold,
Yet things break in and steal the gold.



LONG legs, crooked thighs,
Little head, and no eyes.

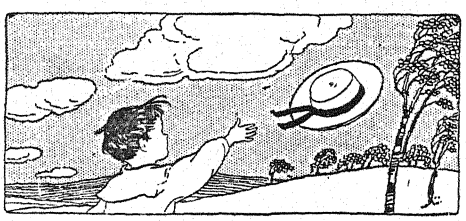
FLOUR of England, fruit of Spain,
Met together in a shower of rain
Put in a bag tied round with a string,
If you'll tell me this riddle, I'll give you a ring.



I HAVE a little sister, they call her Peep, Peep;
She wades the waters deep, deep, deep;
She climbs the mountains high, high, high;
Poor little creature she has but one eye.



ARTHUR O'BOWER had broken his band,
He comes roaring up the land—
The King of Scots, with all his power,
Cannot turn Arthur of the Bower!



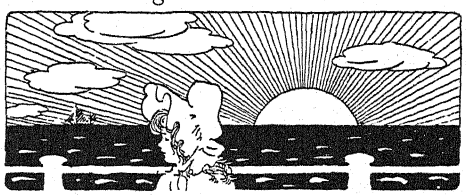
BLACK we are, but much admired;
Men seek for us till they are tired.
We tire the horses, but comfort man;
Tell me this riddle if you can.



AS I was going o'er Westminster Bridge,
I met with a Westminster scholar;
He pulled off his cap, *an' drew* off his glove,
And wished me a very good-morrow.
What is his name?



HICK-A-MORE, Hack-a-more,
On the king's kitchen door;
All the king's horses,
And all the king's men,
Couldn't drive Hick-a-more, Hack-a-more,
Off the king's kitchen door!

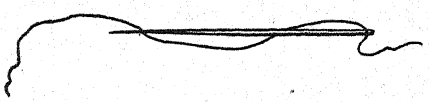


THERE was a king met a king
In a narrow lane;
Says this king to that king:
"Where have you been?"
"Oh, I've been a-hunting
With my dog and my doe."
"Pray lend him to me,
That I may do so."
"There's the dog, *take* the dog."
"What's the dog's name?"
"I've told you already."
"Pray tell me again."

AS I went through a garden gap,
Who should I meet but Dick Redcap!
A stick in his hand, a stone in his throat,
If you'll tell me this riddle, I'll give you a groat.



OLD Mother Twitchett had but one eye,
And a long tail which she let fly;
And every time she went over a gap,
She left a bit of her tail in a trap.



THIRTY white horses upon a red hill,
Now they tramp, now they champ, now they stand still.



AS soft as silk, as white as milk,
As bitter as gall, a thick wall,
And a green coat covers me all.



COCK ROBIN got up early
At the break of day,
And went to Jenny's window
To sing a roundelay.

He sang Cock Robin's love
To the little Jenny Wren,
And when he got unto the end,
Then he began again.

SOME little mice sat in a barn to spin;
Pussy came by, and she popped her head in.
"Shall I come in and cut off your threads?"
"Oh, no, kind sir; you will snap off our heads!"
"Oh, no, I'll not; I'll help you spin."
"That may be so; but you won't come in."



QUEEN ANNE, Queen Anne, she sits in the sun,
As fair as the lily, as white as the swan.
"I send you three letters, so pray you read one."
You must read one, if you can't read all,
So pray Miss or Master throw up the ball.

IN a cottage in Fife
Lived a man and his wife,
Who, believe me, were comical folk;
For, to people's surprise,
They both saw with their eyes,
And their tongues moved whenever they spoke.

When they were asleep,
I'm told—that to keep
Their eyes open they could not contrive;
They both walked on their feet,
And 'twas thought what they eat
Helped, with drinking, to keep them alive.

A PIE sat on a pear-tree,
A pie sat on a pear-tree,
A pie sat on a pear-tree,
Heigh O, heigh O, heigh O!
Once so merrily hopped she,
Twice so merrily hopped she,
Thrice so merrily hopped she,
Heigh O, heigh O, heigh O!

THERE was a man of Thessaly,
And he was wondrous wise,
He jump'd into a quickset hedge,
And scratched out both his eyes.

But when he saw his eyes were out,
With all his might and main
He jump'd into another hedge,
And scratched them back again.

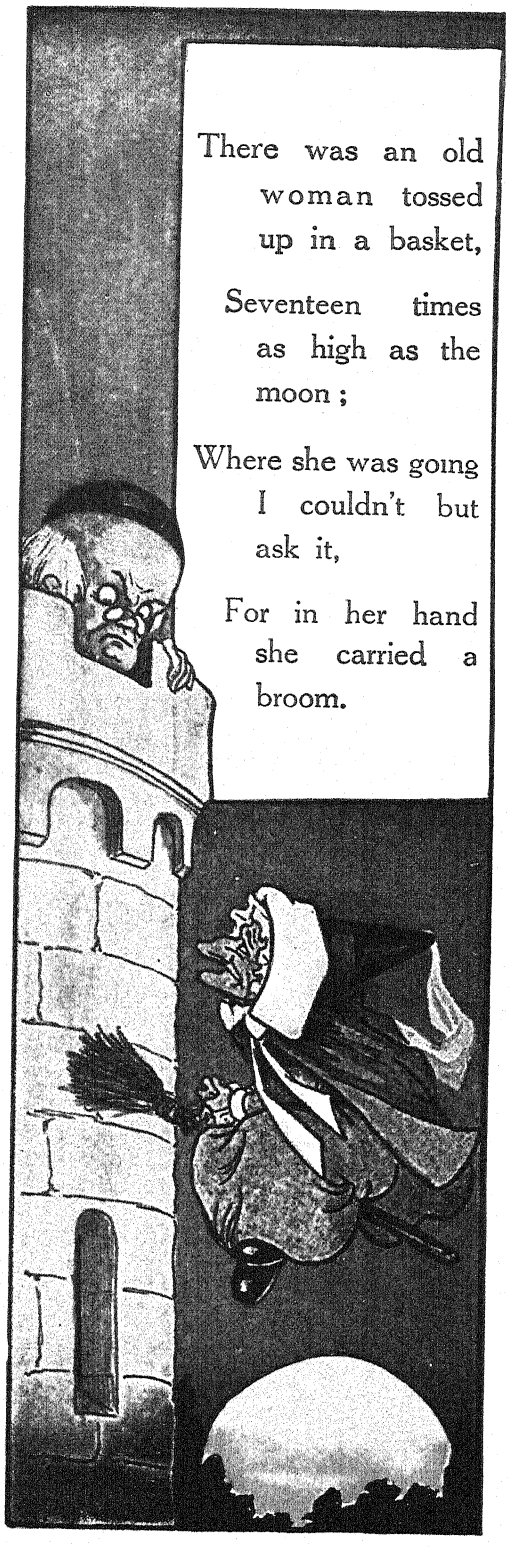
"ROBERT BARNES, fellow fine,
Can you shoe this horse of mine?"
"Yes, good sir, that I can,
As well as any other man;
Here's a nail, and there's a prod,
And now, good sir, your horse is shod."

MY father he left me three acres of land,
Sing ivy, sing ivy;
My father he left me three acres of land,
Sing holly, go whistle, and ivy!

I ploughed it with a ram's horn,
Sing ivy, sing ivy;
And sowed it all over with one peppercorn,
Sing holly, go whistle, and ivy!

I harrowed it with a bramble bush,
Sing ivy, sing ivy;
And reaped it with my little penknife,
Sing holly, go whistle, and ivy!

The Old Woman Tossed in a Basket

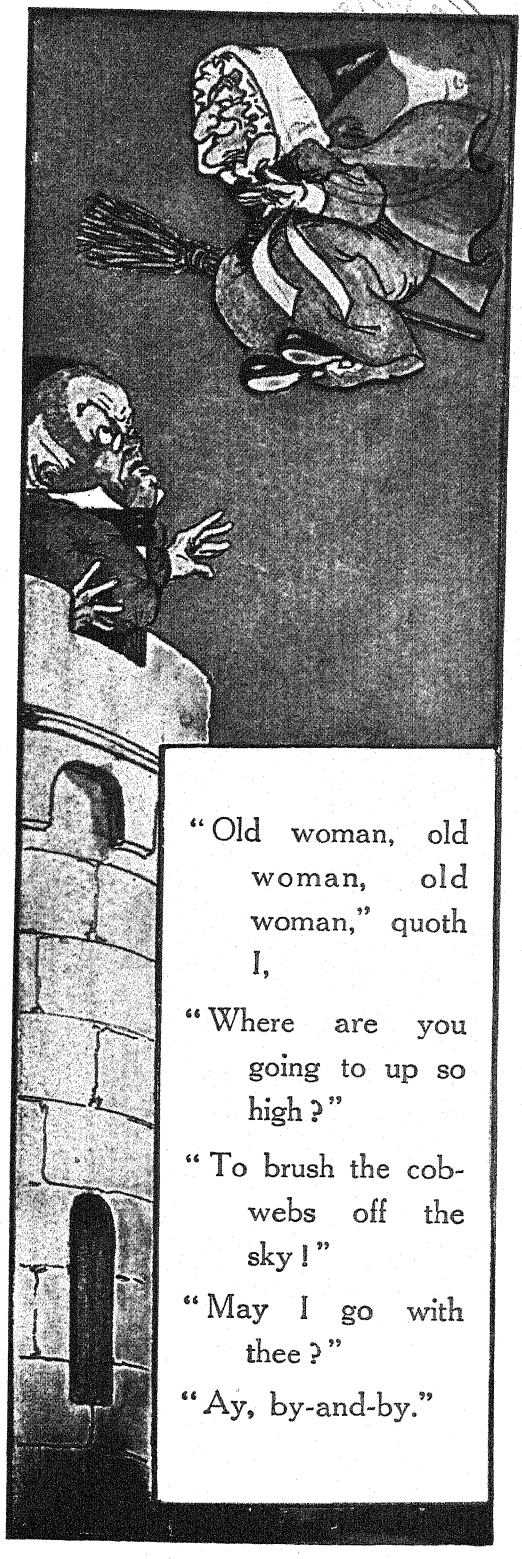


There was an old woman tossed up in a basket,

Seventeen times as high as the moon;

Where she was going I couldn't but ask it,

For in her hand she carried a broom.



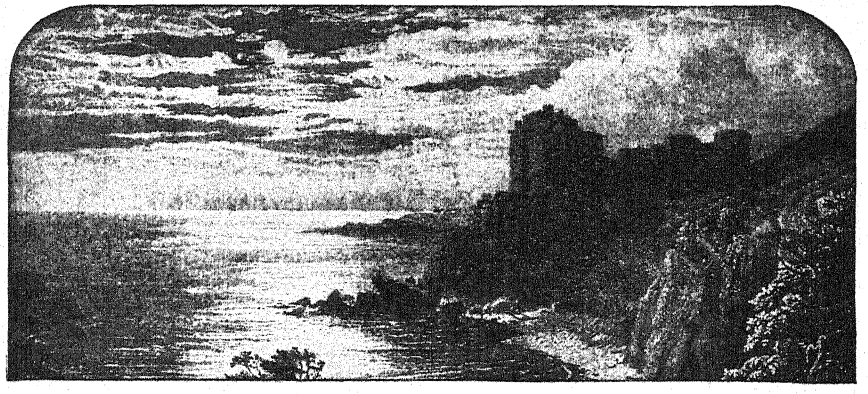
"Old woman, old woman, old woman," quoth I,

"Where are you going to up so high?"

"To brush the cob-webs off the sky!"

"May I go with thee?"

"Ay, by-and-by."



IS THERE A MAN IN THE MOON?

CONTINUED FROM 2912



THERE is certainly no life on the moon as we understand life. If the moon is inhabited at all it must necessarily be by a race of beings utterly different from anything we know on earth. For every living thing on our familiar earth is the creature of our local conditions. For instance, we breathe air, we are dependent on climate, and we are what we are in height and stature solely by reason of the density of the atmosphere. If the density of the air increased, we should become a squat people, unable to walk upright, and unable to lift a small weight; if the density of the air lightened, we should be able to leap over hills and toss heavy weights above us.

Now, there is no atmosphere enveloping the moon, and so the race of possible beings inhabiting that lovely sphere must, to begin with, differ from us in the matter of breathing. They would be without noses and without lungs. And then think of their cities. A temple or a villa on the moon would last for ever. Air would not corrupt it, rain would not tarnish it, lightning would not rend it. Glass windows would not exist there, for without rain and wind who would think of glass windows? Such a thing as a kitchen, or even an ordinary fireplace, would not be found among them, for, as there is no air, no fire can be lighted, no match can be struck. And the people walking through the streets of this eternal city would be a dumb race. They would never speak, because speech does not exist without air; they would make no noise with their feet and with their traction, for sound does not exist without air. If it were possible for all the largest cannon of our earth to be discharged from the moon at the same moment, they would make less noise than a pin falling upon velvet. The moon might be filled with lovely flowers, but they would give off no odor. Birds might sing from every branch, but no note would be heard. Men might cry with all their force to the heavens, but not a whisper would escape their lips.

A soundless, airless, waterless city; eternal and incorruptible, as silent as death, as vivid as life!

WHAT ARE THE MARKS LIKE A FACE ON THE MOON?

If we look at the moon through a pair of opera-glasses, or, still better, through a telescope, we do not see the "face" at all. It merely happens that the marks sometimes look very

like a face to the naked eye. The marks consist of mountains, mountain ranges, craters, and the sunken beds of what were once probably seas and oceans. The most prominent of these markings, and those which help most to give the appearance of a face, are made by volcano craters, and these are quite different from any we know on the earth, because they are enormously larger. I suppose that all the volcanoes on the earth could easily be put together into the crater of one of the volcanoes on the moon. Some of these craters are scores of miles across.

If we have never looked at the moon with an opera-glass or a little telescope, we should do so. We lose the face, but we see far more, and it is not difficult even with a quite small glass to see exactly for ourselves to what the markings that make the face are really due. Often we can see the mountains best when the moon is not full, and then we see them standing out at the edge where the shadow and the light join. Some pictures of the moon and further facts about the wonderful mountain ranges and volcano craters on it are given on pages 2205 to 2211.

Is our earth a moon to other worlds?

The general name for a moon is a satellite, or attendant. The earth itself has one satellite, which we call the moon; Saturn has nine; Jupiter has nine; and so on. A satellite is a body which revolves round some other heavenly body, which is usually called the satellite's *primary*. Our earth, then, and all the other planets, are satellites to the sun, and thus play the part of moons to the sun. But the sun is the only world to which the earth is a moon, for it is the only world around which the earth revolves. It may be that the sun revolves round some other great star, and so is a sort of moon to that star, in which case the whole of the sun's family, including the earth, would be "moons" to that star; but our leading astronomers now think that this is not the case.

Why is it warm in summer?

We might think at first that perhaps the earth is nearer to the sun in summer than in winter, and so the air is warmer and the sun's rays hotter. We know that the earth does not move in a circle round the sun, but in a sort of oval path called an ellipse. But the fact is that, though the earth is nearer to the sun during part of the year than it is during the rest of the year, it is nearest in winter and farthest in summer, in the Northern Hemisphere. The difference in distance is so small that it does not affect the weather much; but no doubt if the earth were nearer the sun in summer and farther off in winter, summer would be a little hotter and winter a little colder than it is.

That our distance from the sun does not make the seasons is plain when we remember that in our winter it is summer in Australia. It is warm in summer because then the sun's rays strike the earth more directly; the sun rises higher in the sky, as we say, and that means the same thing. The air is like a great blanket; it keeps heat in and it keeps heat out. If the sun's rays strike straight downwards to the earth through the air, they do not have to travel through so much of it as if they traveled through the air slantwise.

Why is it cold in winter?

In winter the sun's rays have to pass very slantwise through the air, and so lose a great deal of their power. The reason of the difference between summer and winter—indeed, the cause of all the seasons—is that the earth is tilted on its axis, the line running through it from the North Pole to the South Pole. The globes made to represent the earth which help us to learn geography are always tilted. Imagine the sun as a strong lamp on the floor, and the earth as a spinning-top on the floor, going round the sun. If the top is spinning upright, then at every part of its path round the lamp it will be in the same relation to the sun. But if the top spins tilted, as the earth does, then part of the time the upper half of it will be tilted towards the sun and the lower half away from the sun; and on the other side of its path the upper half will be tilted *away* from and the lower half tilted *towards* the sun. We in the United States live on the upper half of the great top called the earth, and in our summer this half is tilted towards the sun, and in our winter is tilted away from it. So our summer is the Australian winter, and the Australian winter is our

summer. The tilt makes all the difference to the sun's rays as they pass through the atmosphere. It might have been that the earth was not tilted in its path round the sun, and then we should have had no seasons.

WHY IS IT HOT AT THE EQUATOR?

We know that the Equator is the name given to the great line that we imagine to run round the middle of the earth. Of course, there is no *real* line, except on the maps and globes. The belts, or zones, of the earth on both sides of the Equator are called the tropic zones, and are the hottest parts of the earth's surface. The reason is that, no matter whether it is summer or winter, farther north or farther south, in the temperate zones—in one of which all the United States lie—the tropic zones are always very directly exposed to the sun's rays, which strike through the air very straight down instead of slantwise. So the sun rises very high up into the " top " of the sky in the tropical regions, and it is always very hot there. But it is too hot for human life at its best, and the greatest works of man have been done in the temperate regions.

WHY CAN STILL WATER REFLECT THINGS FROM A DISTANCE?

The distance from which the light comes has nothing whatever to do with what happens to it. Still water, like many other surfaces, is a very exact reflector of light. It throws the light-waves back from itself without mixing them up or distorting them. So long as it does this, we can see the image of whatever threw the light. It matters not in the least how far the light has traveled before it reached the water. You can see trees reflected in it, but you can see the moon or the sun reflected in it equally well, though they are scores of millions of miles away.

WHERE DOES PUMICE-STONE COME FROM?

We think of pumice-stone as merely something that rubs our skin so hard that it will take out ink-stains, but it has a wonderful history. The word is really the same as the Latin word *spuma*, which means foam, and we can see for ourselves that this stone is very light and spongy, so that it is almost like foam. It is spongy and full of spaces because it was formed under the influence of intense heat, and the spaces in it were filled with gas when it was made. Pumice-stone is really volcanic rock, formed deep in the earth and thrown out upon the surface from the crater of a volcano. A particular value it has for our knowledge of the earth is that its composition tells us something of the deeper part of the earth's crust. Specimens of pumice-stone, and of the other volcanic rocks, are now being carefully examined to see how much radium they contain in them. When we know this, we shall get some idea of the quantity of radium in the earth's crust at depths about which we cannot yet learn in any other way. The great importance of this is that radium produces heat, and so we can learn how the earth is kept warm, and how much longer it is likely to remain warm, even apart from the sun's help.

WHY CANNOT WE MAKE COINS?

If we had the minting machinery, and if we had gold and the metals which are added to it to make it harder, we could make gold pieces; but we should not be allowed to do so. Even though they were the same in every way as the gold pieces made at the Mint, this would not do, for it is necessary to know how much money is in circulation; and if people could add as much as they pleased to it, this could not be known. Every gold piece added to the circulation of money slightly lowers the value of all the others. In any case, we should not do this, for it would not be worth while. We could get better value for our gold by selling it to the Government—that is to say, we could exchange it for gold pieces, and get more for it than we could make if we had to pay for the machinery and the work.

When men called counterfeiters make " gold pieces," they do not use gold, or, at any rate, they use only a little to gild the coins, so that they may look like gold pieces. If we get twenty real dollars or a real gold piece for a piece of gilded lead not worth a penny, it is theft, and that is why it is not allowed.

WHAT ARE THE GROOVES ROUND THE EDGES OF MONEY FOR?

Pennies and nickel pieces have smooth edges, but silver and gold coins are " milled," as it is called, round the edge. The reason is that people used to pare the edges of coins, especially gold coins, and then sell the precious metal. This

is, of course, a form of theft from the nation's money, and the best way of stopping it was found to be to "mill" the edges of the more valuable coins, so that no one could pare them without letting it be seen at once. Other coins are not milled because it would be worth no one's while to pare their edges.

WHAT MAKES THE BRIGHT COLORS WE SEE WHEN WE SHUT OUR EYES?

The nerves of sight always produce sight, whatever excites them; that is usually light, but it may be many other things. Pressure is one of them, and that is why we "see stars" when we get a blow on the eye. When we shut our eyes very tightly we cause some pressure on the eyeball, and so there are sensations of light produced. Also, there are various things in the eye which are excited by light, and reflect it for a short time even after the eye is shut. Then the curtain at the back of the eye sees these things. We often see things that are in our own eyes in this way. Also, the retina has a way of seeing things more or less faintly after the eyes are shut, and these images are called after-images. Sometimes they are bright, as the thing itself was, and sometimes they are seen as dark images corresponding to the bright thing we have been looking at. Lastly, we must remember that the eyelids allow a certain amount of light to pass through them, so that we still see a little even when we close our eyes in the presence of light. In people who are not well, the brain may give the sensation of light in closed eyes, apart from any light that really exists, and apart from after-images.

WHAT ARE THE SPOTS THAT COME BEFORE THE EYES?

Spots before the eyes are of two distinct kinds. The one kind is permanent. The spots are always there, and always in the same place. They are due to something that should not be in the eye—most commonly a speck of the *cornea*, or the front part of the eye, that is not transparent, having been damaged in some way. Such opaque spots in the cornea throw shadows on the retina and are so seen as spots before the eyes.

The second kind of spots is quite different. These are not permanent. They seem to be in different places at different times. Usually we do not notice them at all. They are the shadows thrown on the retina by white blood-cells moving through the fluids inside the eye, and so getting in the way of the light. As these cells move about, of course, the shadows they throw are not seen always in the same place. White cells are always traveling about in the eye, more or less, but usually we do not notice them.

When we have been awake all night, or have grown tired from staying up too late and becoming too excited, we get spots before our eyes, because our nerves have been made *too* sensitive, and so they notice the shadows of these cells, which a healthy eye does not notice. It is one of the most important facts about living matter, especially nerves, that when they are weak they become *too* sensitive or irritable; and this is called "the irritability of weakness."

WHERE DOES ALL THE DUST GO?

Dust is made of very different things, and its fate varies accordingly. Some dust is mainly made of particles of carbon, and these are gradually washed into the soil by the rain. We do not know whether they are useful there. Some of them get into our lungs and stay there. Then much dust is made of organic matter—substances derived from living creatures, such as horses, for example.

These street deposits of animals are a very important part of town dust. They find their way into the sewers, and so to the sea; or often to the soil, where, like all organic matter, they are extremely useful for the growth of vegetable life. This dust often gets into our eyes and throats, and probably helps to cause the colds that are so common in towns. Town dust will be really healthier when horses, dogs, and cats are kept under better control—if, indeed, they are allowed in towns at all. Also, a considerable part of the organic matter in dust is consumed and oxidized by the oxygen of the air, partly under the influence of the sun, and partly by the action of microbes.

WHY IS THERE SHINGLE ON PARTS OF A COAST, AND SAND ON OTHERS?

This depends on the earth's crust in various places. The shingle that is found on some coasts is made by the action of the sea on rocks made by fire, and therefore called *igneous* rocks, from the Latin word for a fire. In some countries near the layer that forms the shingle there

is a layer of chalk, and that is also broken down by the sea-water. Chalk, as we know, is a deep-sea deposit of the bodies of living creatures. In other places the history of the earth's crust has been different. There the exposed layers have been mostly formed by deposits of material at the bottom of the sea. This forms the very crumbly sort of rock called sandstone—a good example of the opposite class of rocks to those called igneous. The sandstone class of rocks is called *sedimentary*, because they were formed as a sediment, or deposit, under the water. Nevertheless, the same elements, silicon and oxygen, compose both sand and shingle.

WHAT DO WE MEAN BY GREENWICH TIME?

It is plain that as the earth spins round, the sun must appear to rise in the east sooner, the further east we are, and later, the further west we are. So the apparent time, judged by the sun's rising and setting, is different in different places, according as they are east or west of each other; indeed, midday on one side of the earth is midnight on the other side. It is not a question of north or south, because the earth does not spin in the north-south line, but in the east-west line.

So it is necessary to have some agreed place from which to take our time, and the place on which many nations have agreed is Greenwich. They have their own time for their own purposes; but for general purposes, as, for instance, events occurring in the sky, they refer to Greenwich time—that is to say, the time reckoned by what the sun seems to do at Greenwich. The lines on maps up and down the earth's surface from north to south are called lines of longitude. They are narrower in the north and south than at the Equator, of course, and meet at the Poles—like the lines usually made by the knife when we cut a melon in the most usual way. Places on the same line of longitude as Greenwich have Greenwich time exactly, and no other place can have it.

WHY DOES TIME GO ON AND NEVER STOP?

It is very difficult for us to understand at first, but there is really no such thing as time. All the wise men who have thought about it are entirely agreed as to this. What goes on and never stops is *change*. There is change around us, as in the movements of the earth, and the moon, and the sea, and animals, and there is also change in ourselves; in our bodies and in our minds. It has been said that "nothing is constant but change." We get our idea of what we call time from our experience of change in ourselves and in what is around us. This change never stops, and so we say that time never stops. We take something that changes regularly, such as the position of the earth as it moves round the sun, and we measure time by that; or we take the change of day and night. If everything that happens, within us and without us, were to happen a thousand times more slowly, we should not notice that things were happening more slowly; there would be nothing, within us or without us, by which to notice it.

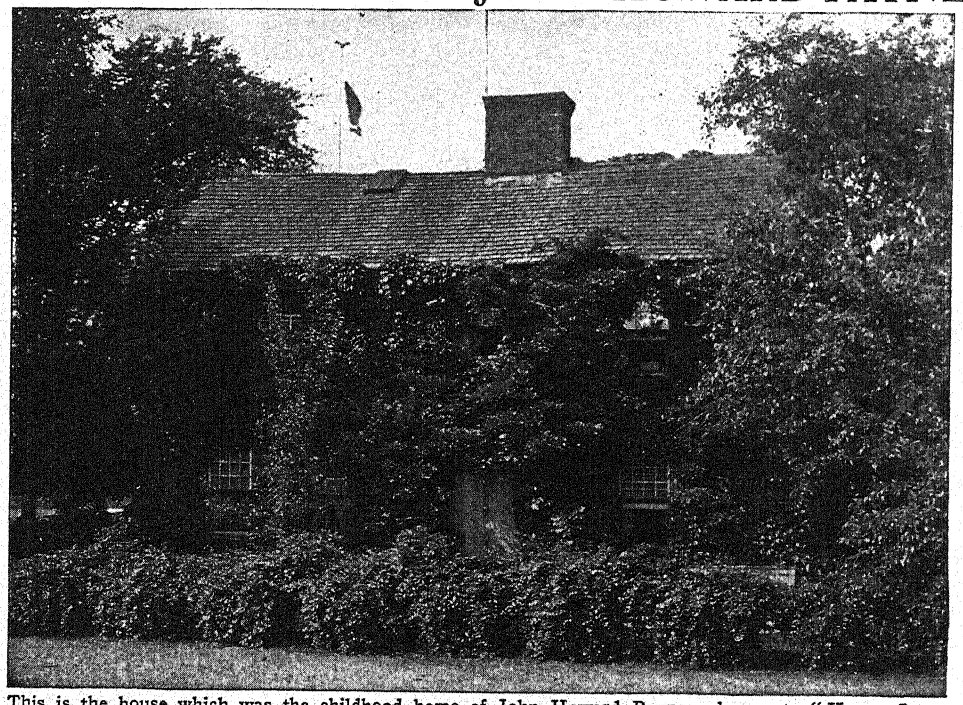
If change were to cease; if everything stayed where it is at this moment, say, four o'clock in the afternoon; if the shadows grew no longer, and night did not come; if we did not get hungry or thirsty; if our minds did not think of things, and if our limbs did not grow tired, and if everything whatsoever, within and without, were to remain exactly as it is this instant—then there would be no time until change began again. We all think at first that that is not true, but the reason why we do think so is that we cannot help thinking of change as going on somewhere, and so of time as going on too.

WHY IS A SNOWFLAKE LIGHTER THAN A RAINDROP?

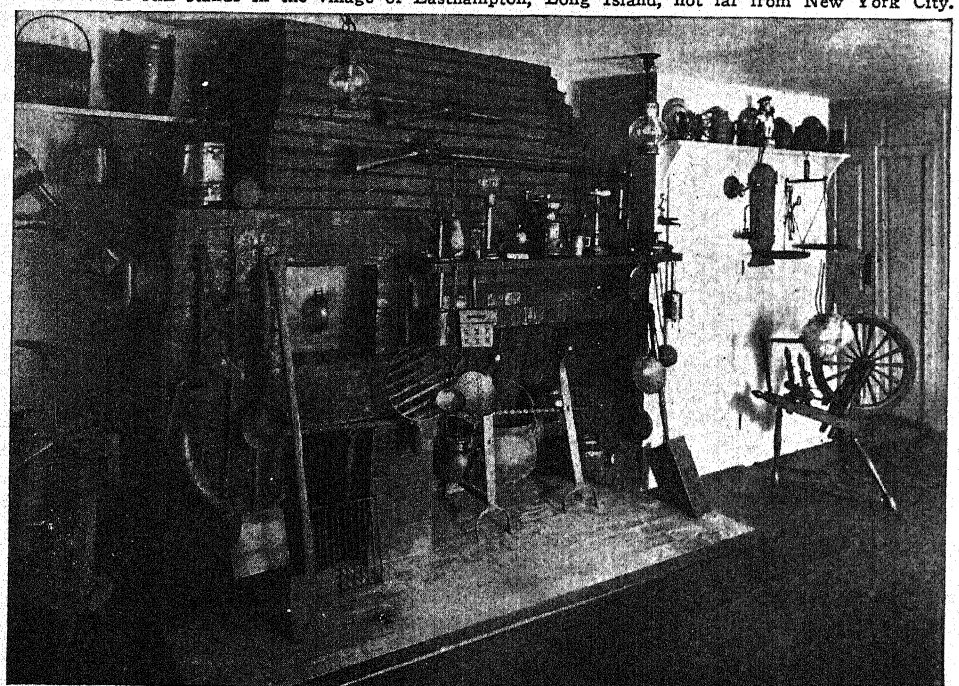
A snowflake is made of ice-crystals—that is to say, of solid water. Now, it is a most important and peculiar fact about water that ice is lighter than liquid water, even though it is colder. The general rule, of course, is that things grow heavier as they become cooler and lighter as they grow hotter, because heat expands them and cold contracts them. But at just near its freezing-point water does not obey this rule; it *expands* as it grows cooler and freezes. That is why it bursts pipes in winter. So a snowflake is made of water in a lighter state than the water in a raindrop, and yet another reason why the snowflake is lighter is that there is a great deal of air among the ice-crystals. This makes the whole thing lighter, just as the air in the holes of a sponge makes it lighter.

THE NEXT QUESTIONS ARE ON PAGE 3143.

THE EARLY HOME OF JOHN HOWARD PAYNE



This is the house which was the childhood home of John Howard Payne, who wrote "Home, Sweet Home," a song which has touched the hearts of thousands. Such songs as this have an influence that no one can estimate. Probably this was the home to which the heart of the writer turned with so much affection. It still stands in the village of Easthampton, Long Island, not far from New York City.



Old-fashioned people said "the kitchen is the heart of the home." In days when life was simpler, much time was spent in the kitchen, which was usually a large, bright room where the cooking and the spinning and other household tasks were done. This picture shows the great fireplace of the kitchen of John Howard Payne's home.

Upper picture copyright by Brown Bros.

WHAT THIS STORY TELLS US

MANY songs are written, but few live, and those that do are remembered because they express some of the deepest feelings of the human heart. When a writer gives us a song that does this, a song in which the whole nation perhaps can sing of its love of home and country, he has woven one of the cords that binds the nation together. The songs that can truly be called national have something of greatness in them, and the story of their writers is worthy to be held in our remembrance. This story tells us about some of the writers of our most famous American songs and the times and places when the songs were written.

AMERICAN SONGS AND SONG WRITERS

CONTINUED FROM 3030

SONG writers were not welcomed in the early days of New England. The singing of songs was frowned upon by our stern Puritan forefathers as an ungodly practice, and it was not until the eighteenth century that they tolerated anything except the Psalms of David in the churches. There were no choirs in those days. The clerk or precentor, or sometimes the minister himself, gave out the tune and the psalm. He then "lined out" the psalm, that is, he read it out line by line, while the congregation sang it after him. Probably the younger members of the congregation found this practice almost as doleful as we should. After a time the people protested that as there were now plenty of books in the colony, and the majority of the congregation could read just as well as the minister and clerk, they saw no reason for continuing it. The clerks and the older members of the congregation clung fast to the old custom. The younger members persisted, and there was as much turmoil in the churches as there was at a later day, when it was first proposed by some of the Scotch Presbyterians to use organs. The first book made on the American continent was a psalm book, The Whole Book of Psalms Faithfully Translated Into English Metre, which was printed at Cambridge, Mass., by Stephen Daye, in 1640, and was commonly called the Bay Psalm Book.

Even outside of New England, the first settlers could scarcely be called a singing people, and those who did sing, sang the songs which came from England. The isolated mountaineers in the southern states continued to sing these songs down to our own time. A valuable collection of old English songs and ballads, sung as their ancestors learned them in the time of the Stuarts, has been obtained from the singing of these mountaineers.

Where there was little singing, there was no encouragement to write songs, and we find no famous song writers until after the Revolution. Interest in singing was aroused, however, at the end of the eighteenth century by a man named William Billings, a tanner, who lived in Boston. He was an uncouth little man, lame and half blind; but he burned with a pure flame of enthusiasm which no amount of ridicule could quench. He was almost quite self-taught, and it is said that he wrote his first compositions on the walls of the tannery and on sides of leather. He wrote the Singing Master's Assistant and the Psalm Singer's Amusement. It is said that he introduced the pitchpipe, so that precentors could give accurately the note on which to commence an unaccompanied tune, and that he also introduced the use of the 'cello to lead the singing in churches. About the same time, the singing schools, which

Copyright, 1911, 1918, by M. Perry Mills.

our grandfathers and grandmothers knew so well, appeared here and there. Since that time, there has been no lack of interest in singing.

American poets and composers have shown remarkable aptitude for creating popular songs. They have brought together words and music which the public have welcomed and sung with delight because they expressed what was in the hearts of all men and women. More than once our songs have touched the hearts of other nations too and have gained a world-wide popularity. Although some critics have called them crude, some of the greatest composers in the world have recognized genius in their very simplicity.

Music has been called "not food for the soul but wine." A stirring song lifts the spirits of those most exhausted and depressed, and helps them to fresh courage. When some years ago need arose for more overseers of the laborers on the Panama Canal, overseers who could sing and influence the men to sing while at work were given the preference. For it had been found that the cheering influence of singing kept the men from homesickness and helped them to do better work.

However beautiful they may be, songs which deal with peculiar or individual experiences instead of with those which everybody knows and shares, never stir great enthusiasm. To be popular a song must draw people together with a sense of brotherhood. It must express some universal feeling simply and directly.

WHY THE CONCORD HYMN DID NOT BECOME POPULAR

The Concord Hymn by Ralph Waldo Emerson, sung at the completion of the Battle Monument at Concord on the anniversary of the battle of Lexington, is a beautiful poem. But because it is the work of a man somewhat withdrawn from the mass of his fellow men it lacks this necessary quality. Its patriotic theme and its literary beauty have not been enough to make it popular.

A sentiment which comes to everybody as he or she grows older is love of what has been familiar in childhood. The first successful American songs were mostly of this character. One such is The Old Oaken Bucket, written in the summer of 1817 by Samuel Woodworth, the son of plain people, and a man of little education, but of strong, true feeling. Songs like his; like Roll on, Silver Moon, by Joseph Turner of Charlestown, Mass., who set his words to an English tune, are what most appealed to the popular fancy before the crisis of war aroused demand for music impelling more stirring emotion.

SONGS OF SENTIMENT AND HOME

Of all the songs inspired by love of home, Home, Sweet Home has been the most enduringly popular. Like many another favorite, it was written for the stage. Its author, John Howard Payne, was living at that time in Paris. He had been sent there by an English theatrical company to find and adapt French plays and operas for the English stage. One opera which he thus made over and in fact largely composed was Clari, and for its homesick heroine he wrote his famous song. He himself was lonely and homesick for his native America, and the words express his mood of love and longing, the mood of all exiles from what is dearest and most familiar. But for this song John Howard Payne would now be forgotten. Yet in his own day he was a celebrity for other achievements, and he became one very young.

He was born in New York June 9, 1791, of fine old New England stock. Most of his childhood was spent in Easthampton, L. I., where the home he immortalized may still be seen. He was an uncommonly handsome and gifted boy, with a strong desire to go on the stage. Unknown to his family, the young stage lover started and conducted a little theatrical paper called The Thespian. The New York Evening Post decided to reprint one of The Thespian's articles, and this led to acquaintance between young Payne and Mr. Coleman, editor of the Post. Mr. Coleman was astonished to find the able writer a lad of only fifteen. He became interested in him and with another gentleman raised funds to send him to Union College, Schenectady, N. Y. Payne still desired to go on the stage and finally money troubles caused his father to consent. For a few years the youth had a brilliant success as an actor both here and in England. Then strangely enough his talent flagged and changed. Some power went out of him which never returned. He finally withdrew from the stage and supported him-

self by writing, adapting, translating, and in various ways belonging to stagecraft.

Like many another man of talent, he was lacking in practical sense. However much money he was making, he never managed to save for the future. He never could be thrifty. He was in money difficulties, when, through the influence of friends, he was appointed American Consul at Tunis, where he died in 1852.

The world went on singing Home, Sweet Home, and those who had known its author felt that he was entitled to at least a grave in his native land. Thirty-one years after his death Mr. W. W. Corcoran had the poet's body brought from Tunis to Washington, D. C. The President, his Cabinet and a body of soldiers escorted it to Oak Hill Cemetery, where it was laid finally to rest.

NEGRO MELODIES—A DISTINCTIVE FORM OF AMERICAN SONG

Our American song-writers have the distinction of having created a unique form of popular song, negro melodies. That these have a singular charm has been acknowledged the world over. Sometimes plaintive, sometimes rollicking, they are characterized by simple, tender and appealing melody. Most of them appeared originally in Minstrel Shows, a form of entertainment altogether American and for many years immensely popular, both before and after the Civil War. They were a curious mixture of buffoonery, local and contemporary jokes, and these delightful songs. Many of the best known—Way Down upon de Swanee Ribber, Old Uncle Ned, My Old Kentucky Home, Old Black Joe, Old Dog Tray, and many others—about 160 in all—were written by a Northern man,—Stephen Collins Foster, of Pittsburgh. It is sad that a man whose genius has for so long been a source of good and pleasure should himself have been unhappy and unfortunate. His career was wrecked by intemperance. His life began in a most promising way, for he was the youngest and well-beloved son of cultivated, well-to-do people. He was born on July 4, 1826, to the strains of The Star Spangled Banner, which was being played on his father's lawn by a Pittsburgh band. Stephen had every advantage of education. From a little child he was a musical prodigy and composed songs. His first published song, Open Thy Lattice, appeared when he was sixteen. From that time he became increasingly popular. His songs earned a great deal of money but it was for other people. Stephen remained poor. Two songs, Oh Susanna, and Uncle Ned, he gave to a friend, who made $10,000 out of them.

The Christy Minstrels had a great reputation in his day and nearly all Foster's songs were written for them. Old Folks at Home has proved the most lastingly popular. It has been translated into many languages and is known and loved the world over. The pathos of its words has expressed the longing for friends of many a homesick heart.

After his death in Bellevue Hospital as the result of an accident when he was thirty-eight, Foster was carried to Pittsburgh and buried beside his parents.

A NORTHERN WRITER WHO WON SOUTHERN FAME

Another songster who won love and fame but not money was Daniel Decatur Emmett. He wrote many popular songs and one very famous, Dixie. He was a well-known minstrel himself, a clever actor and singer, loved as "Old Dan Emmett" by his comrades on the stage. In spite of his great popularity he is said to have earned only about $600 in all as a song-writer. Like Foster, he too began to write when very young. Old Dan Tucker appeared when he was fifteen. He was a Northern man, in sympathy with the Union cause, which makes it an odd fact that he should have written Dixie, the great war song of the Confederacy. He wrote it in 1859 for the well-known Bryant's Minstrels, of which show he was then a member. "I wish I was in Dixie" was a much used phrase with show people forced to travel in the chilly North in the winter instead of in the balmy South. It occurred to Emmett on the blustering autumn day when he had set himself to write a new song for his show. He was in New York, and there Dixie was first sung. A year and a half later it was introduced into the opera Pocahontas, and first sung in the South at the Pontchartrain Theatre in New Orleans. A company of Zouaves marched on the stage singing it, were received with great enthusiasm, and it immediately became popular throughout the South, the favorite tune of the Confederate army. When many years later Mr. Emmett visited the South as the author of Dixie,

he received an ovation everywhere. The friendly old man enjoyed the attentions heaped upon him but soon had enough and was glad to return to his little home at Mount Vernon, Ohio. There in a plain cottage, busy with his chickens and his garden, he lived very simply and contentedly until his death in 1904 at the age of 89.

YANKEE DOODLE, AMERICA'S MOST POPULAR DITTY

Nobody knows just how or why Yankee Doodle became our national ditty. We know that our poverty-stricken, ill-equipped soldiers cheered their spirits by singing it during the weary marches of the American Revolution. The story goes that a certain Dr. Schuckburg, an army surgeon, is responsible for introducing to the army as a famous military air of England what really was an ancient nursery rhyme. His joke was more successful than he could have foreseen. It found favor with our ragged regiments. The rollicking verse joined to the melody suited the rough and ready spirits of the rank and file. The tune has won high favor from no less an authority than the famous pianist Paderewski. From Rubenstein, too, who played it with variations while in America. Many different words have been set to it. After the original doggerel, the most noteworthy version is perhaps The Battle of the Kegs, written by Francis Hopkinson, father of the Hopkinson who wrote Columbia. This poem commemorates a well-known incident of the Revolution, an attempt by David Bushnell of Connecticut to blow up the British fleet at the mouth of the Connecticut River by floating kegs of powder down on them. The attempt failed through the premature explosion of one keg.

From time to time more dignified words have been written to the tune of Yankee Doodle, but none have succeeded in replacing the first doggerel in popularity. Yankee Doodle, as we know it, has been aptly called "our national Mother Goose, the nursery rhyme of the American Army."

THE STAR SPANGLED BANNER AND HOW IT WAS WRITTEN

A sentiment which we all share is love of country. Naturally this stirs us most in periods of national stress and struggle. When war clutches the land our singers have always burst forth in patriotic song. Our war songs have come from the hearts of their writers. When Francis Scott Key, then a handsome and clever young lawyer, wrote The Star Spangled Banner he could not have foreseen that it would become the National Anthem of his native land, and that every night, when the flag is lowered at sunset, at every fort and on every flagship of the navy it would be played by the military bands. All night Mr. Key had listened to the bombardment of Fort McHenry near Baltimore. If the fort fell, he knew that Admiral Cockburn, commander of the British squadron, would proceed to attack Baltimore. The day before Mr. Key, in an American vessel which our government had placed at his disposal, had visited the British flagship to obtain the release of a friend who was prisoner of war. This was granted, but the two, with one other American, were detained on their vessel for fear that if allowed to land they would reveal the British plans. While daylight lasted the anxious Americans watched the flag. When dawn revealed it still floating above the fort, they knew the attack had not succeeded. Then, in his joy of relief, Key drew an old letter from his pocket and on its back wrote the first stanza of The Star Spangled Banner. He finished the poem later in the day, when his vessel had been allowed to land. It was first printed as a hand-bill enclosed in a fancy border. One of Key's friends, Judge Nicholson of Baltimore, saw that the tune of Anacreon in Heaven, an old English drinking song, fitted the words, and the two were quickly united with astonishing success. Military bands seized upon the new hymn and it was played upon every occasion. From that day to this its popularity has never flagged. The old flag which prompted the poem, much torn by shot and shell, much cut down from its original size, still exists. It was stoutly made to withstand time by Mrs. Mary Pickersgill.

HAIL, COLUMBIA

Like so many of our songs, Hail, Columbia was written for the stage. It was first sung at an Actor's Benefit in Philadelphia in 1798. The actor, Gilbert Fox, for whom the benefit was given, anxious to have the occasion a success, asked a clever friend, a young lawyer named Joseph Hopkinson, to write a patriotic

song. Mr. Hopkinson wrote the poem and set it to the tune of the President's March. The tune, which greatly helped the popularity of the song, is said to have been composed by a Philadelphia musician of German descent named Roth. It was received with great favor, the big audience joining in the singing. People flocked to hear it. This popular melody is said to have had a helpful influence on public affairs. There was at the time some danger that the United States might interfere in difficulties then increasing between France and England. Hail, Columbia awakened home pride and patriotism and a feeling that we had problems enough of our own without interfering with those of other nations. Philadelphia was then our National Capital, and hearing of the stirring new song, President Adams and his entire Cabinet went to the theatre to hear it.

OUR NATIONAL HYMN AND THE MAN WHO WROTE IT

America, so well known and loved by American school children, was written in February, 1832, by Samuel Francis Smith, a graduate of Harvard College and at the time a student in the Theological Seminary at Andover, Mass. The young man was a passionate lover of music. He was twenty-three when he was given a collection of songs in which the music of the British National Anthem was included. He was so impressed by the dignity of the tune, and its rhythm that he set to work to compose words to it that would be suitable for the circumstances of his own country. The result was My Country, 'Tis of Thee, and no other hymn has been found to take its place in the affections of the whole people. Though he lived to be eighty-seven and wrote other hymns and songs, he never equalled its great success. It is said to have taken him only half an hour to pen the words so familiar to us all.

Many legends have sprung up about one of our most familiar songs—John Brown's Body. We know that the tune belonged originally to an old camp meeting hymn. Some investigators claim that the John Brown meant was an ungainly Scotch soldier, whom his comrades loved to tease. His regiment, the 12th Massachusetts Infantry, was the first to sing the song, of which there have been many variations. The soldiers and the public generally have always loved it and refused to substitute finer words or poetry for the cruder doggerel. William Steffe, writer of many much loved hymns, is said to have composed the music.

THE BATTLE HYMN OF THE REPUBLIC

Mrs. Julia Ward Howe's great Battle Hymn of the Republic was originally intended to supply nobler words to the John Brown tune. She wrote it at the request of James Freeman Clarke, who went with her and others to visit an army post near Washington. She heard tired soldiers singing John Brown's Body as they returned from a skirmish, and while the wounded were being carried to their pallets, the stirring strains took possession of her and kindled her ready patriotism to lofty expression. A woman of genius, of fine character, of highest ideals for her country, she put her best of heart and mind in her great poem. The Battle Hymn of the Republic ranks as the finest song of the Civil War.

MARCHING THROUGH GEORGIA

Marching Through Georgia is one of our greatest war songs. The man who wrote it, Henry Clay Work, had very little technical education in music. In his patriotism he found inspiration for the stirring words and music which many a time were to cheer and help along weary, footsore soldiers. Oddly enough, General Sherman, the leader of that famous march, is said to have always felt a great dislike to the song.

Another war song,so beloved and stimulating it was often ordered sung, just before the men went into battle, was Tramp, Tramp, Tramp, the Boys are Marching, and the stirring song The Battle Cry of Freedom. Unlike Work, the author, George F. Root, was a musical scholar and teacher of music, and in his day one of the first authorities in musical matters in this country.

An ardent young Southerner, James Ryder Randall, impatient that his native state should delay in joining the Confederacy, wrote Maryland, My Maryland, considered one of our finest war songs and the best beloved by southern people. He wrote it at a single sitting in the dead of an April night in 1861, in New Orleans, where he was then employed upon a newspaper. The words were published in the New Orleans Delta, received with great favor, and very soon set to music.

A young lady, Miss Jennie Cary of Baltimore, had the honor of establishing My Maryland as an army song. She set it to a German melody, and sang it upon the occasion of a serenade given her sister at Fairfax Court House, Virginia, by a body of General Beauregard's troops. Another well loved song of the Southern Confederacy was The Bonnie Blue Flag. There is some doubt whether it was written by Henry McCarthy, author of other songs, or by Annie C. Ketcham of Kentucky. We know that it was first sung at the Varieties Theatre in New Orleans in 1861.

Song singing by soldiers is recognized as of so much importance that when our armies were in training for the Great War, conductors were sent to every camp to teach the men to sing together. Many good songs have been recently written, specially for the soldiers.

AN OLD SONG WHICH WAS REVIVED

The public had to some extent forgotten a once very popular song when the great success of Du Maurier's story, Trilby, both as novel and play, in which this song, Ben Bolt, was introduced, brought it back to favor. The author was Dr. Thomas Dunn English, a physician, and a reserved and scholarly man. He wrote his one famous song by request as a poem for the New York Mirror, and was considered sufficiently paid by the honor of having it printed. The words appeared in 1843. It was quickly perceived that they were well adapted to singing and various tunes were tried. The first was discarded. Another composed by Dr. English was not successful. Finally a German melody with some adaptations was found to fit the words and the new song became widely popular in America and England.

COLLEGE SONGS AND COLLEGE SINGING

The college song, whatever its rollicking form, is apt to have something of academic flavor. Notably so is the case of one of the most famous—Fair Harvard—written by Samuel Gilman. He was an alumnus of the great university of which he sang. Born in Gloucester, Mass., in 1791, he became a Unitarian clergyman. He was forty-six years old, living in Charleston, S. C., when he wrote the song.

College singing helps greatly in fostering the community feeling which is one of the best things in college life. No celebration in a college is complete without singing, and many a desperate game has been won on the enthusiasm created by the singing of the students on the benches round the field. What football player on the Yale team does not remember how his tired muscles responded to the reproachful singing of Boola-boola, or what Princeton man can forget the fresh courage that he gained, when the strains of Old Nassau thundered across the field? Many of the most popular college songs, however, take much of their interest from the music to which they are set, and the verses themselves are of little worth. The college song books contain many songs which are common to most of the colleges, but each college has its own distinctive songs. Most of these, however, were written by students, many of whom only wrote for love of their college, and sometimes even the name of the writer is unknown. In most cases the song was written in praise of some particular college, and its fame rarely spreads beyond the college alumni.

THE BEAUTY OF NEGRO SPIRITUALS

No account of songs and song writers in America is complete without some mention of the negro "spirituals" the recollection of which is kept alive by the students at Fisk University, Hampton and Tuskegee. The words of the spiritual songs, in which the negro slaves of the plantations poured out their hearts, are rough and crude, but they are full of intense pathos and feeling. The tunes to which they were set are all in minor keys, and when sung in the open air by soft negro voices, such songs as Swing Low, Sweet Chariot, Oh! dem Golden Slippers and a number of others produce a wonderful effect. They were first introduced to the world by the "jubilee singers" of Fisk University, to which many of the negro race owe a good education.

America is justly proud of her hymn writers—of the Cary sisters, Dr. Mühlenberg, Bishop A. C. Coxe, and many others who were able to voice the religious longings and consolations of which all the world knows something. We tell of some of these writers of hymns in another part of our book.

THE NEXT STORY OF MEN AND WOMEN IS ON PAGE 3133.

WHAT THIS STORY TELLS US

THE grass that makes the countryside so beautiful, and provides the soft green carpet that we delight to walk upon, is so plentiful almost everywhere in the world that we think little about it and the many different forms that it takes. We see some of the more common wild grasses of North America in the part of this book that begins on page 1339, and in the following pages are some more pictures of familiar American grasses, which will help us to know these grasses by name when we see them growing in the fields or by the wayside. Grasses are very hardy, and in a fight for life between trees and grasses, when man takes no part, the grasses win the day, as shown by the vast treeless prairies in our land which were formed when the human inhabitants were few. In another part of this book we find pictures of most familiar American trees with their leaves and flowers.

SPLENDOR IN THE GRASS

CONTINUED FROM 3021

WATER, it has been prettily said, is the eye of the world. Grass, let us add, is the soft mouth of Nature's face. It is only with water and with grass that the earth can smile, that the austere sadness of her countenance breaks up and gladdens with laughter. When the wind moves across the ocean or passes over the tall grasses, the face of the earth changes; she forgets her antiquity; she loses all count of the tragedies and desolations which have strewn her fields since the dawn of creation; she becomes like a babe in the cradle, sunning over with her smiles.

Homer sang of "the innumerable laughter of the sea," and David of the laughter of the cornfields. There we have the eye and the mouth of the world.

The grass of the earth has inspired men with gloomy ideas rather than joyous. We can think of five or six sad sayings concerning grass for every one that is happy. "In the morning it flourisheth and groweth up; in the evening it is cut down and withereth." "As for man, his days are as grass." "All flesh is grass," and so on. Even a poet like Wordsworth hints that only a child can receive the full joy of it:

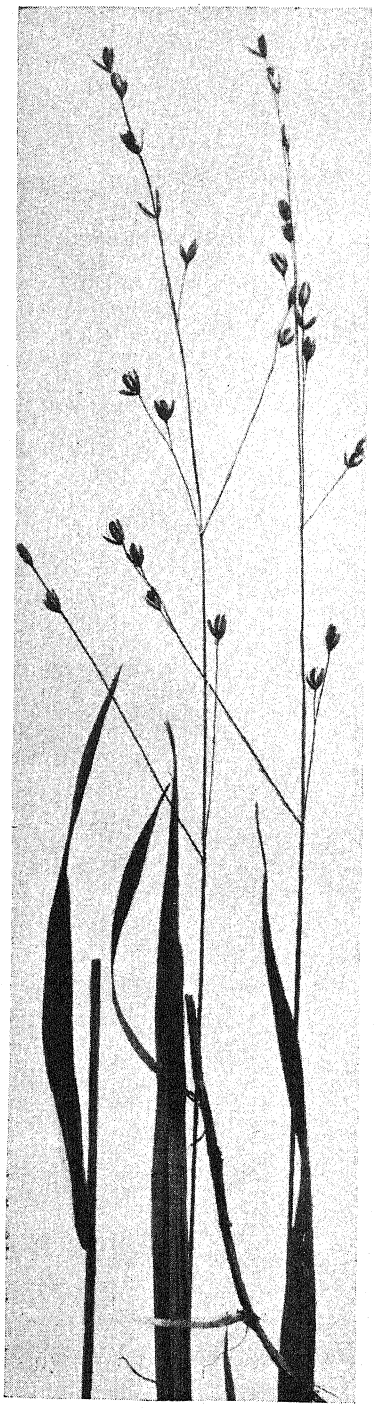
> . . . Nothing can bring back the hour
> Of splendor in the grass, of glory in the flower.

But joy is the note of grass. How a little patch of it, even when shaven and shorn, breaks up the grey sadness of cities! How good it is to get off the pavements and strike across the fields! How pleasant to escape from four walls and rest our eyes upon the little lawn in our garden! And if these things be pleasant and good, what shall we say of the great summer pageant, when all the valleys stand high with waving grass, and the whole face of Nature flickers and dimples and overflows with the ripple of its joy? Then it is that we feel the undying childhood of this old world, then it is we realize the eternal infancy of Nature.

Take into your hand as much as it will hold of bird-seed. Look at those minute specks—white, brown, grey, and black, some quite round, others three-sided, and some no shape at all. Feel how they run like sand through your fingers. How light they are, these myriad grains! There are millions and millions and millions of these tiny seeds, which feed the birds of the earth.

The fields of the earth, standing thick with grasses, are full of these joyous grains. The wind blows, the grass waves, the little seeds stick to their nests. Then the gleaner comes, and the seeds are shaken out like a waterfall—the fields empty themselves into the granaries of men. But there are millions of acres where no man comes, and where the grasses are filled with seeds, more in number than the stars; they are even as the sand on the seashore; and from the earliest days of the earth they have come down to us with the message of the waving grass that "God's in His heaven, all's right with the world."

SOME MORE FAMILIAR GRASSES



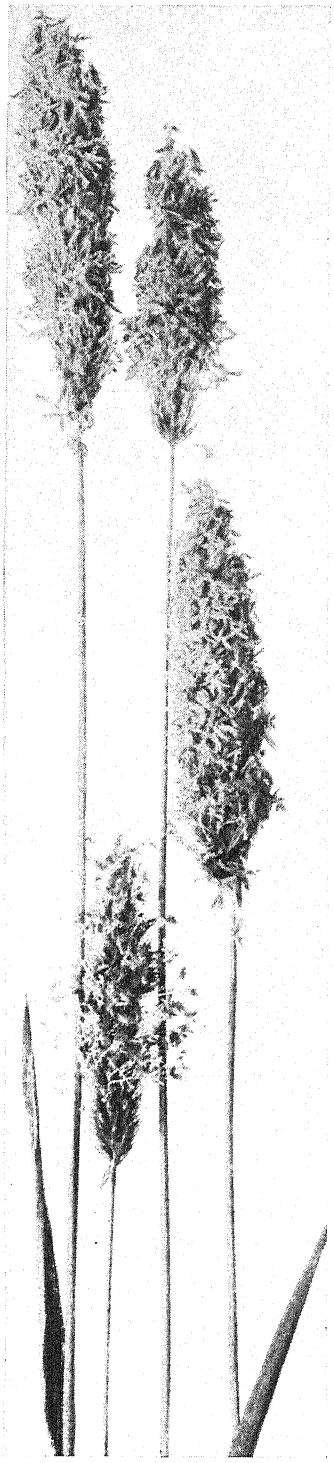
WOOD MELIC
GROWING IN SHADY PLACES, MAY & JUNE



FALSE OAT
GROWING ON ROADSIDES, FROM JUNE ONWARDS

Wood melic has fewer flowers borne on its stems than any other grass. We see this if we compare its picture with those of other grasses. As in the case of false brome, shown on page 1346, the false oat gets its name from the doubt which has arisen as to whether it is an oat grass or not. It is generally considered to be one.

The photographs on these pages are by Henry Irving

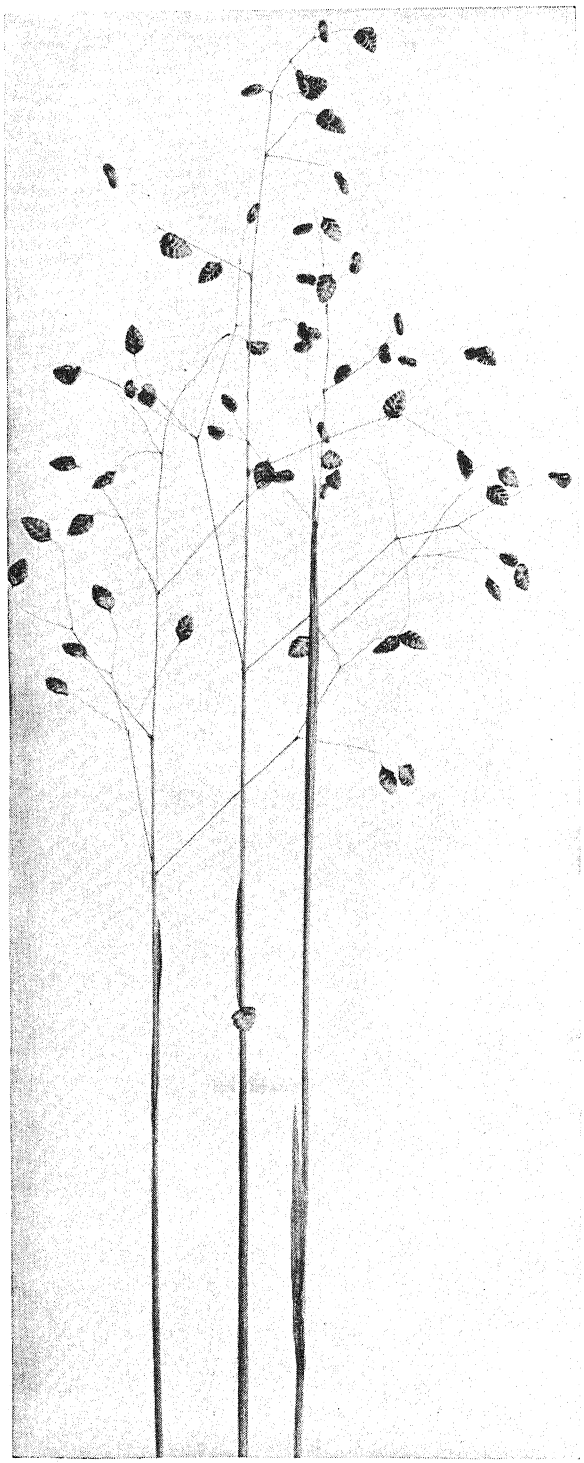


MEADOW FOXTAIL
GROWING IN MEADOWS, FROM MAY

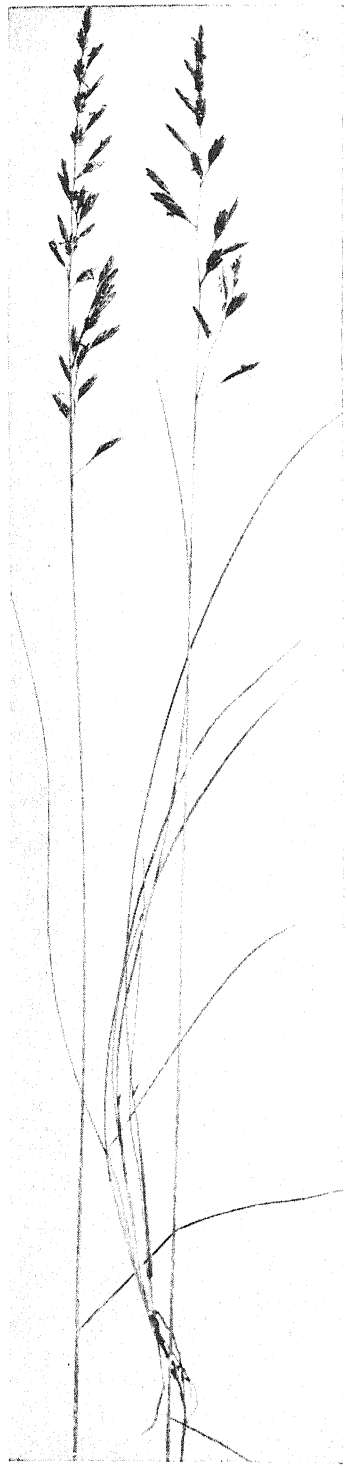


WILD OAT
GROWING IN CULTIVATED FIELDS, IN JULY AND AUGUST

In some parts of the old country, foxtail used to be called "guinea grass," because English children, and sometimes grown-ups, too, used to collect the heads and sell them for a guinea a bushel. From the wild oats have sprung the cultivated sorts with which oatmeal and other articles of food are now manufactured.



COMMON QUAKING GRASS
FOUND ON DOWNS & POOR PASTURES, IN JUNE & JULY

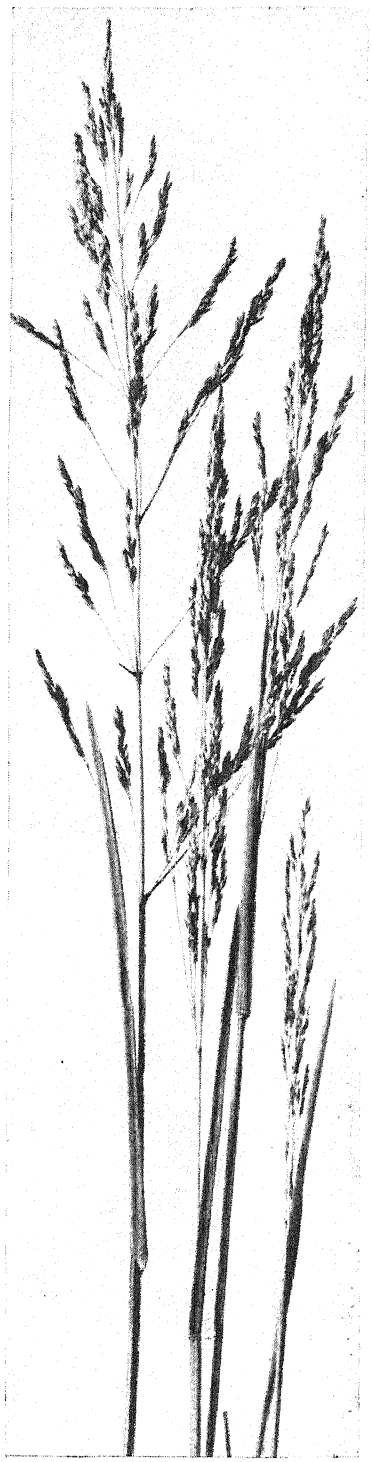


SHEEP'S FESCUE
FOUND ON DOWNS & MOORS, IN JUNE

Quaking grass has this curious name because it quakes, or trembles, in the slightest breath of air, when all the other grasses are standing still. As we may judge by its name, sheep's fescue is a favorite with sheep. It grows in rough places which would otherwise afford no food for flocks. Fescue means "stalk."

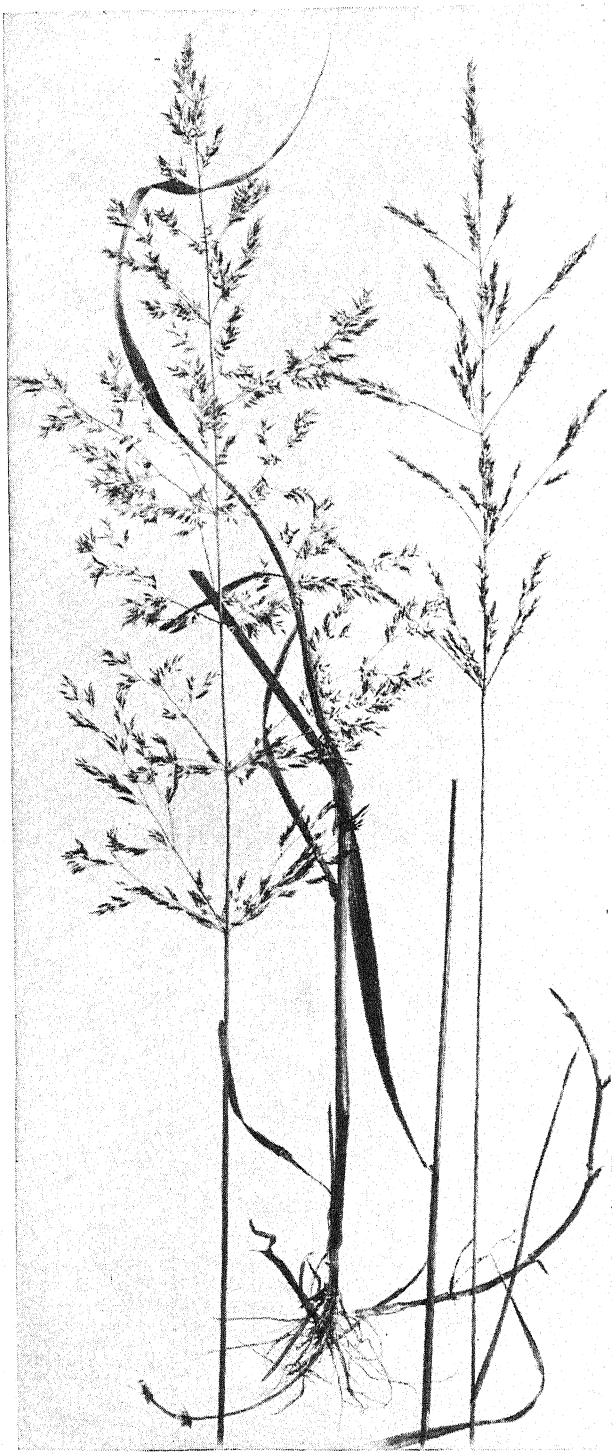


TALL FESCUE
GROWING IN MOIST MEADOWS, IN JULY & AUGUST

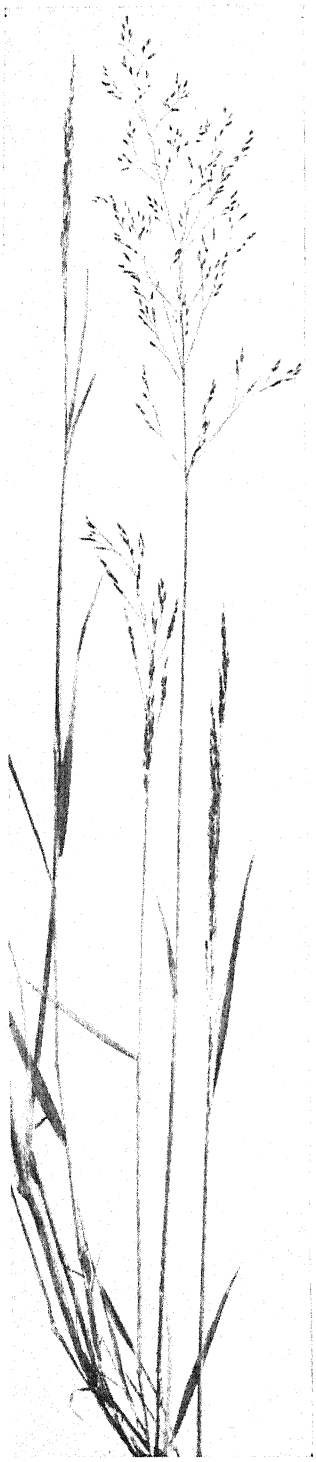


SMOOTH MEADOW GRASS
GROWING IN MEADOWS, JUNE & JULY

Tall fescue grass does not make very good food for cattle, but it is useful in another way, for it grows so tall that it can be cut down and used as a litter, or bed, for animals. Smooth meadow grass is one of the lime-loving grasses. Hence it is to be found often in company with crested dogstail, shown on page 1343.

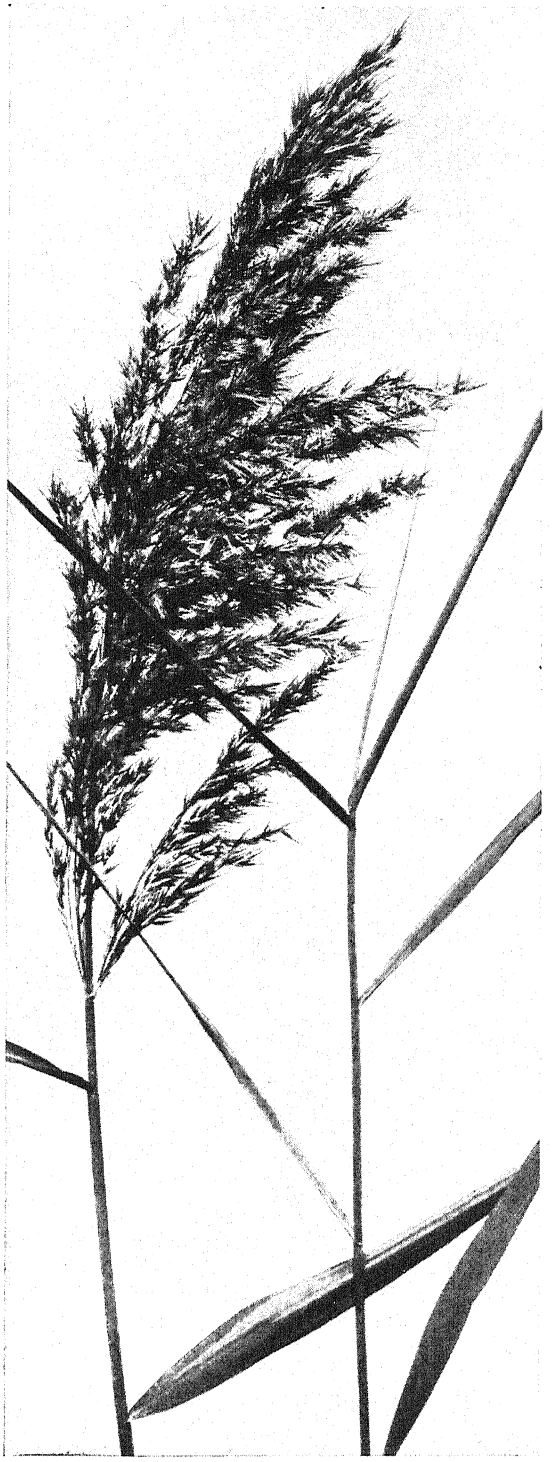


MARSH BENT GRASS
GROWING IN DAMP PLACES, FROM JULY ONWARDS

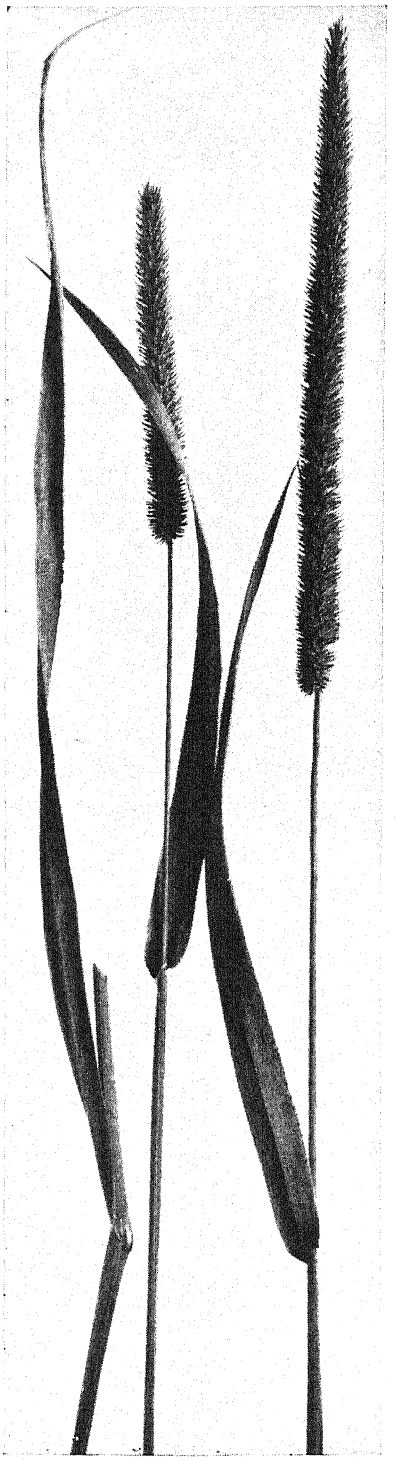


BROWN BENT GRASS
FOUND ON PEAT MOORS, JULY

Bent grass is a very hardy grass—that is to say, it is difficult to kill. For this reason we find that the grass which grows by the roadside, or where there is much traffic, is largely bent grass. It is also a useful grass to plant on sandy hill slopes where otherwise water is likely to wash the earth away.

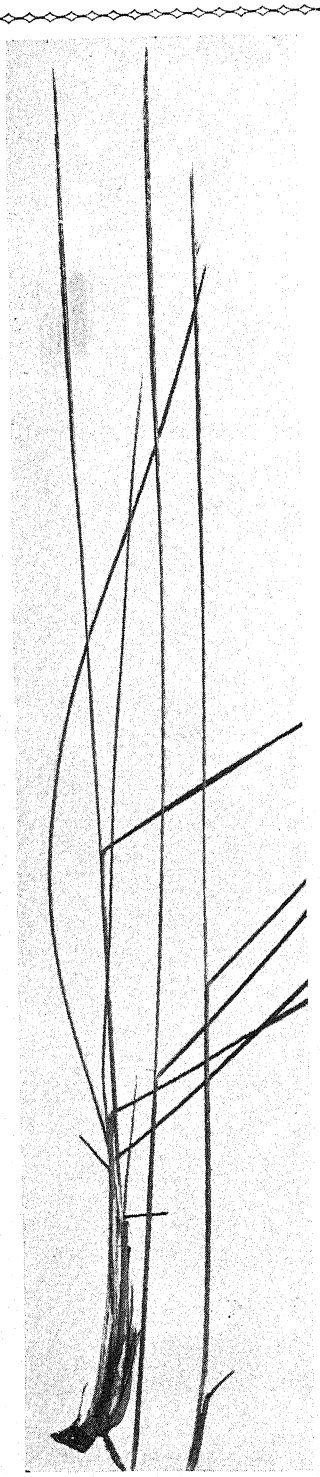


COMMON REED
GROWING BY PONDS AND MARSHES, IN SEPTEMBER

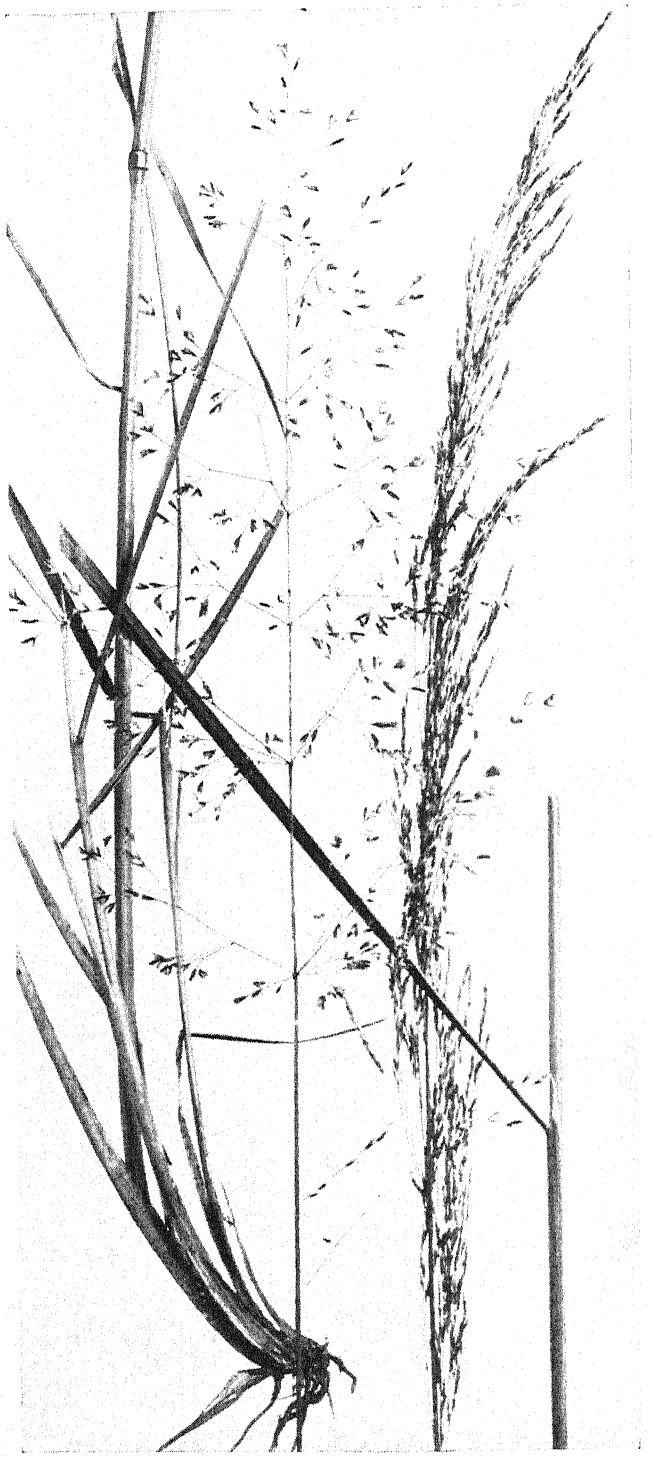


COMMON CATSTAIL
GROWING IN MEADOWS, JULY & AUGUST

It is easy to tell reed grass from others, because it is much later in flowering than the other waterside-loving grasses. When we look at common catstail, we can see that there is no other grass quite like this, and that it deserves the name of catstail. You can hardly fail to notice it as you pass through the fields.



MAT GRASS
GROWS ON WET MOORS, JUNE



TUFTED HAIR GRASS
GROWING IN DITCHES AND WET PLACES, IN JULY

Mat grass, sometimes called marram, meaning "sea-straw," is found on sandy "dunes" or "denes" by the seashore. In Northern Africa, where it grows taller than elsewhere, it is cut and used for the manufacture of paper. Tufted hair grass is generally to be found in the company of floating foxtail, shown on page 1342.

THE NEXT STORY OF NATURE IS ON PAGE 3195.



THE ROSE POGONIA, A BEAUTIFUL ORCHID

WILD FLOWERS OF CANADA

PART II

CONTINUED FROM 2886

THE lovely Arethusa or Indian Pink, another Orchid, is common in marshes in June. The flower is rose-purple and large, with a bearded lip. The one-flowered stem grows from a globular bulb, and is sheathed at its base by a solitary, linear leaf, hidden in the sheaths of the stem and protruding after flowering. Burroughs writes: "Arethusa was one of the nymphs who attended Diana, and was by that goddess turned into a fountain that she might escape the god of the river Alpheus, who became desperately in love with her on seeing her at the bath." Our Arethusa is one of the prettiest of the Orchids, and has been pursued through many a marsh and quaking-bog by her lovers. She is a bright pink-purple flower, an inch or more long, with the odor of sweet violets.

Sweet Pogonia is another rare but beautiful Orchid. It has rosy blossoms, and a perfume suggesting ripe red raspberries. The stem is about eight inches high and bears a single ovate or lance-shaped leaf near the middle, and a solitary flower at the summit.

The beautiful Calopogon or Grass Pink is a lovely Orchid, with a loose raceme of four to twelve delicate, pink flowers in a loose cluster at the top of a scape six to twelve inches high. The flowers seem to be upside down, as the tip is at the top. A single grass-like leaf sheathes the stem near its base, as it rises from a solid bulb. This exquisite flower raises its graceful head only in deep, wet swamps and bogs, where it is difficult to reach it.

The Purple Fringed Orchid is found in wet meadows in early June. A smaller species appears in July. The lower leaves are oval or oblong, passing into lance-shaped bracts above. The flowers are purple, rather large, and grow in a spike. Each flower has a fan-shaped, three-parted lip with fringed divisions, and a long curving spur. Under date of June 9th, Thoreau writes: "Find the great fringed orchid out apparently two or three days—a large spike of peculiarly delicate, pale-purple flowers growing in the luxuriant and shady swamp—the village belle never sees this more delicate belle of the swamp—only the skunk or owl or other inhabitants of the swamp behold it."

Copyright, 1913, 1918, by M. Perry Mills.

THE MONUMENT CHOSEN BY LINNAEUS

The Twin Flower belongs to the Honeysuckle family.

". . . Beneath dim aisles, in odorous beds,
The slight Linnaea hangs its twin-born heads."

It has a slender, creeping and trailing stem, and rounded, evergreen leaves. The delicate, pink, fragrant flowers grow in pairs, nodding on threadlike, upright flower-stems. The calyx is five-toothed, and the corolla bell-shaped and five-lobed, and hairy within. The delicious perfume of the nodding pink flowers fills the air and draws one to their home in the cool moss of the woods. The great Linnaeus selected this little plant as his monument and named it Linnaea borealis.

Another pretty flower of June woods is Bunch-berry or Pigeon-berry. It has a stem five to seven inches high, and ovate pointed leaves, which are crowded into a whorl of four to six. At first sight, the flowers appear like a single white blossom, but on closer inspection it is found that what appeared like white, round petals are really the white leaves of the involucre which surrounds a cluster or head of small, greenish flowers. The fruit is bright red and berry-like, and lends beauty to the woods and swamps in late summer. They are edible, and form part of the winter food of denizens of the northern woods of Canada.

"Born in the purple, born to joy and pleasance
Thou dost not toil or spin,
But makest glad and radiant with thy presence
The meadow and the lin."

THE REGAL FLEUR-DE-LIS, THE FLOWER OF CHIVALRY

The Large Blue Flag or Fleur-de-lis is beautiful in form and color. The Fleur-de-lis, the "flower of chivalry" chosen by Louis VII as his badge, was the White Iris, which is even more regal and beautiful than the blue species. The latter species has a solitary flower from a green spathe, at the end of a long stem. The flower is large and showy, violet-blue, variegated with green, yellow or white, and purple-veined. The perianth consists of three outer recurved divisions, and three inner smaller and erect parts. The three stamens are covered by the three over-arching, petal-like divisions of the style. The foliage leaves are flat and sword-shaped, green, and are folded into flat clusters at the base. The stem is one to three feet high, stout, angled on one side, and leafy. It abounds in wet meadows and ditches, and the flowers appear in June. The Blue Flag flower possesses a special interest to the botanist because it is an example of a flower which has guarded itself against self-fertilization. The divisions of the style over-arch the stamens, and this arrangement effectually prevents self-pollination. Bees carry pollen from one flower to another. It is said that bees like blue flowers. The insect lights on one of the recurving sepals, and, guided by the conspicuous veins, thrusts his head and back beneath a branch of the style and sips the honey at the base of the stamens. The pollen is sifted on his back. In withdrawing he leaves the stigma of that flower untouched, but the projecting lip of the stigma of the next flower visited scrapes his back and thus secures the needed pollen.

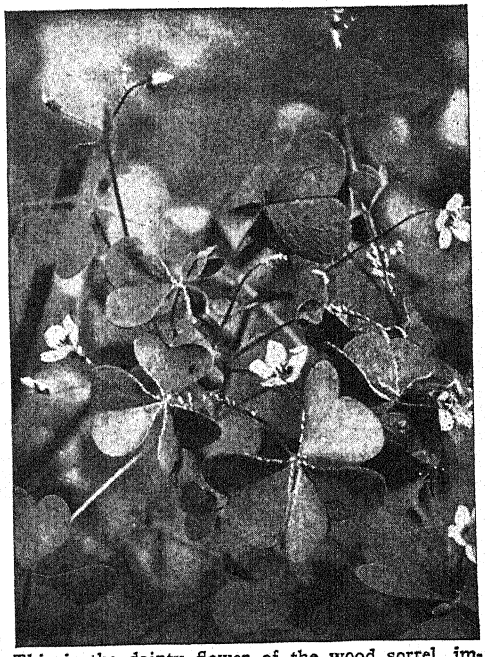
The Blue-eyed Grass blossoms in June, and belongs to the Iris family. The plant is about one foot high with narrow, grass-like leaves, and small blue flowers with a yellow centre. The flowers open in the morning but close later in the day. It is common in meadows from the Atlantic to the Pacific Ocean.

ANOTHER PURPLE FLOWER

The Fringed Polygala is a delicate and lovely flower blossoming in early June. It prefers a sandy soil in rich woods and is found in Eastern and Middle Canada. The stem is three or four inches high, from long prostrate or underground stems. The upper leaves are green, ovate and crowded at the summit; the lower leaves are scattered and scale-like. The whole plant has a fresh and tender aspect. It has large, showy, purplish flowers, rarely white, with corollas which are conspicuously fringed and crested. In addition to these showy blossoms the plant bears small hidden flowers on its underground stems—"one playful flower for the world, another for serious use and posterity."

In June woods the much-divided leaf and rounded flower-clusters of Wild Sarsaparilla are often seen, and later in the year the dark berries are noticeable.

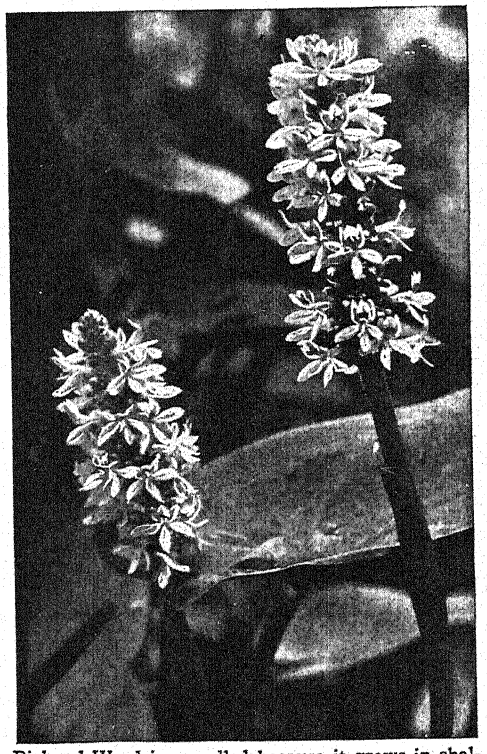
CANADIAN FLOWERS



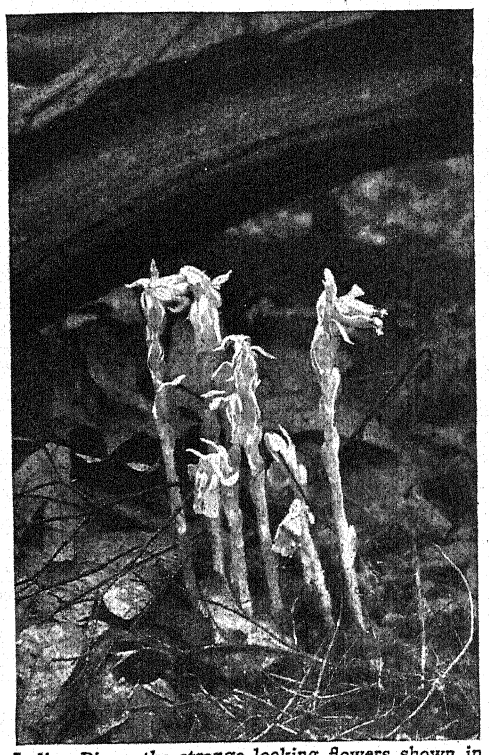
This is the dainty flower of the wood sorrel, improperly called the shamrock. The flowers are white, red-veined and sometimes tinged with purple.



Several Orchids are found in Canadian woods. The Showy Orchid, shown here, blooms in May. One petal makes a platform on which the bees alight.



Pickerel Weed is so called because it grows in shallow waters where pickerel may be found. Its blue flowers, which form a close spike round the stem, bloom from July to September. It has one leaf.



Indian Pipes, the strange looking flowers shown in this picture, have no green foliage. The bracts which grow from the stems take the place of leaves. The flowers get their name from their shape.

The stem bears a single, large, long-petioled, much-divided leaf, and a shorter naked scape which bears the rounded flower-cluster of small greenish-white flowers. The long roots are fragrant and aromatic, and are often sold as a substitute for genuine Sarsaparilla.

THE GERANIUMS OF THE WOODS

Wild Geranium is a common woodland plant flowering in early summer. The stem is erect and one to two feet high, and the leaves are rough-hairy. The leaves are five-parted, with the divisions lobed and cut. The flowers are quite large, magenta or pale-purple, and grow in clusters at the ends of the branches. The corolla is regular, with five petals. The calyx is hairy and has five sepals. The beak-like appearance of the fruit, which splits at maturity so elastically as to discharge the seeds to some distance, gives the common name Cranesbill. Geranium is the Greek word for Crane.

Herb Robert is another geranium very similar to the last, but smaller. Its leaves are smaller and more deeply cleft, and the flowers are coarser in texture. The stem is usually stained with red, and both stem and leaves emit a strong odor when bruised.

THE SORREL, SOMETIMES CALLED THE SHAMROCK

Wood Sorrel belongs to the same family. Sorrel is from the German word Sour, and has reference to the acrid juice of sorrels. The White Wood Sorrel makes a dainty carpeting in June woods. The flowers are frail looking, about one inch broad, with five white petals veined with red, and are solitary on little scapes two to five inches high. The leaves are divided into three clover-like leaflets which "sleep" at night—that is, they droop and close one against another. The early Italian painters used it as a model. Ruskin says: "Fra Angelico's use of the Oxalis Acetosella is as faithful in representation as touching in feeling. The triple leaf of the plant and white flower stained purple probably gave it strange typical interest among the Christian painters."

By many the three-parted leaf has been considered the shamrock of the ancient Irish, and these people think its leaf was used by Saint Patrick in his endeavor to prove to his audience the possibility of a Trinity in unity. "Cuckoo meat" and "Cuckoo bread" are English names for the flower because it comes with the Cuckoo; and the odd name "Alleluia," given it in Europe, recognizes its advent near the glad Easter season. The Yellow Wood Sorrel has fragrant bright, golden-yellow flowers. It is not a woodland plant but is common along roadsides, and in gardens and fields, from Nova Scotia to Manitoba. The stem is leafy and slender, and the flowers, which open only in the sunshine, are in few-flowered clusters at the end of the stem. After the flowering season, little, erect, pointed pods take the place of the flowers.

FLOWERS THAT LIVE THROUGH THE YEAR

The Partridge Vine is an evergreen vine clothed with dark, shining, rounded green leaves, which are often veined with white. At all times of the year this pretty trailing vine, with its little evergreen leaves, adorns the moist woods and woodside banks in Eastern Canada. The little cream-white flowers appear in June and July, and are succeeded later by bright red berries which, though nearly tasteless, are much liked by birds. The unmolested berries remain on until the following spring, when they may be found among the waxy flowers.

THE DAINTY LITTLE WINTERGREEN

The Wintergreen or Checkerberry is a much prized little evergreen found in the cool shade of evergreen woods. The stem is three to six inches high, slender and leafy at the summit. The leaves are oval, about one inch broad, sparingly toothed, shining green, evergreen, and edible. The delicate little white flowers are urn-shaped, with the corolla five-toothed, and they usually hang in twos on slender peduncles, just beneath the spreading leaves. The flowers are delicate and pretty, with a background of shining leaves. The leaves have a pleasant aromatic flavor, similar to that of sweet birch, and are sometimes used as a substitute for tea. The bright red berries are also edible and savory, and are relished by birds and deer during the winter.

TWO UNPLEASANT FLOWERS

The Indian Poke or False Hellebore is a plant which attracts attention in early spring and summer, not because of its

CANADIAN FLOWERS



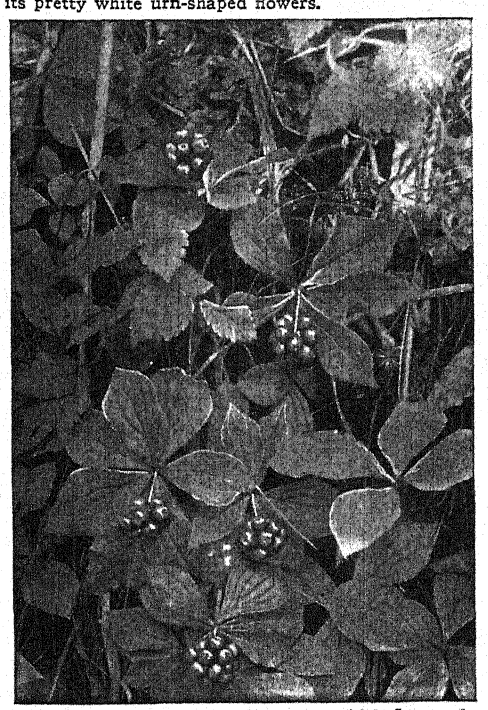
The pretty little cream-white flowers of the Partridge Vine bloom, in moist woods, in June and July. The flowers are quickly followed by bright red berries.



We all know the evergreen leaves and red berries of the Wintergreen, but not so many are familiar with its pretty white urn-shaped flowers.



Here we have the greenish-white flowers of the Wild Sarsaparilla, which bloom in June. The root of the plant is sometimes sold as a substitute for the true sarsaparilla. Dark berries succeed the flowers.



This is the fruit of the Bunch-berry, which flowers in June. The flowers are small and greenish in color and surrounded by white leaves. They are quickly followed by bright red berries, which the birds eat.

dingy flowers, which appear in June, but because of its tall stems, two to seven feet high, clothed with many large broadly-oval, pointed, clasping leaves. The root is coarse, fibrous and poisonous. It grows in swampy woods and roadsides.

Somewhat similar in name, but quite different in form, is Indian Pipe, another dweller in deep woods. It is a low, fleshy herb three to eight inches high, without green foliage, but with colorless bracts in the place of leaves.

"In shining groups, each stem a pearly ray,
Weird flecks of light within the shadowed wood,
They dwell aloof, a spotless sisterhood.
No Angelus, except the wild bird's lay,
Awakes these forest nuns; yet, night and day
Their heads are bent, as if in prayerful mood.
A touch will mar their snow, and tempests rude
Defile; but in the mist fresh blossoms stray
From spirit-gardens, just beyond our ken."

The flower is white or pinkish, single, terminal, and nodding—the bowl of the pipe. The plants spring from a ball of matted rootlets which are parasitic on decaying vegetable matter. The clammy touch of the plant, its waxlike whiteness in life, and its disposition to decompose and turn black when plucked and handled, make the name "Corpse plant" seem singularly appropriate. The Indians used it as an eye lotion.

BEECHDROPS AND CUCUMBER-ROOT

Beechdrops or Cancer-root is another fleshy, parasitic plant of northern woods. These curious looking plants have slender, branching fleshy stems, purplish or yellowish in color, without leaves but covered with small scales. The flowers are purplish or yellowish, small, and of two kinds, the upper sterile and the lower fertile. The Pine Sap or False Beechdrops is another parasitic plant very similar to the true Beechdrops, found from June to August in oak or pine woods. It is tawny, reddish, or whitish. The flowers are clustered and fragrant.

The Indian Cucumber-root is found in deep woods, has a tuberous rootstock, which in shape and flavor resembles a cucumber, and was probably used as food by the Indians. The stem is slender, from one to three feet high, with leaves in two whorls, the lower whorl of five to nine oblong pointed leaves set close to the stem, the upper whorl of three or four much smaller leaves. The flowers are greenish-yellow, small, clustered, and set close to the upper leaves. In September, the brilliant foliage and purple berries of the little plant attract attention.

Leaving the forest, and approaching the bank of a fresh water stream or shallow pond, one's attention is attracted by the blue, closely-spiked flowers of Pickerel-weed, which blossoms from July to September. The stem is stout and usually one-leaved. The leaf is arrow or heart-shaped, and clasps the stem about midway, while others on long petioles grow from the rootstock. One may fish for pickerel in the shallow water where Pickerel-weed grows.

THE GORGEOUS FLAME BESIDE THE BROOK

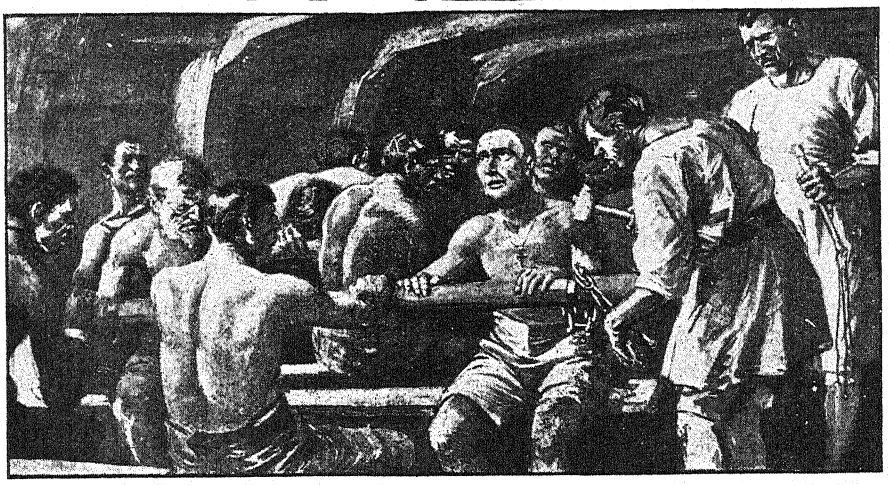
I close this description of common Canadian wild flowers which blossom in spring or early summer by a reference to one of the most attractive of all.

"As if some wounded eagle's breast
Slow throbbing o'er the plain,
Had left its airy path impressed
With scarlet rain."

The early French Canadians were so impressed with the beauty of the Cardinal-flower that they sent the plant to France as a specimen of what the wilds of the New World could produce. In late summer its brilliant red gleams from marshes and moist ground along brooks, from Nova Scotia to Manitoba. The stem is two to four feet high, and hollow. The leaves are alternate, narrowly oblong or lance-shaped and closely set to the stem. The showy spike is loosely set with bright red flowers. The corolla is somewhat two-lipped, the upper lip of two erect lobes, the lower lip spreading and three-cleft. The flowers are frequently visited by and chiefly fertilized by the Ruby-throated Humming-bird. The English name likens it to the gorgeously attired dignitaries of the Roman Catholic Church.

When one has come upon a brook or a marsh glowing with this gorgeous flame he can never forget the sight. No flower of the greenhouse or the garden can surpass these proud plants which swing in the breezes like moving flames among the green.

THE NEXT STORY OF CANADA IS ON PAGE 3151.



THE FRIEND OF THE SLAVES

CONTINUED FROM 3001

ABOUT three hundred years ago, at a time when the ships of those days ventured out of port in hourly dread of attack by sea-robbers, a French vessel coasting along the Gulf of Lions was seized by three African pirate corsairs. They killed the captain, and the crew and the passengers, including a young priest, Vincent de Paul, were chained and shut up in the hold.

The prisoners were cruelly treated, though many of them were suffering from wounds received in defending the vessel. Being landed at the port of Tunis, they were sold as slaves in the market-place. The young priest did all he could to encourage his fellow-prisoners. He was sold to a fisherman, and then to a Moorish physician, who took a liking to the clever youth, and promised him freedom, and a life of ease and honor, if he would turn Mohammedan. But he replied that he preferred slavery to giving up the Christian religion. Soon after that his master died, and he was sold again to a native of Venice, who had not withstood the same temptation to renounce his religion.

Now, Vincent de Paul did the work of a field laborer on his master's farm. He talked to his master's wife; and when she discovered through him what a true and beautiful religion her husband had given up, she was grieved, and persuaded him to become a Christian again.

That was a dangerous thing for him to do in a Moorish country, so the master and his slave escaped alone in a small boat to Europe.

Vincent de Paul's life was full of change, and he seems to have done kindnesses to numbers of people he met. He visited and comforted the sick in a Paris hospital, and at one time acted as tutor in the family of Count de Joigni, who had to inspect the convict ships, or galleys, as they were called, in the harbors.

The poor priest knew what it was to be a slave, and his heart was stirred to pity at the sufferings of the miserable convicts. He could not rest till he had gained permission from King Louis XIII. to do what he could to help them and to give them alms. So he became the king's almoner.

In visiting a gang of convicts at Marseilles one day, he found a poor broken-down man in chains, and despairing at the hardships his wife and children were enduring while he was unable to care for them. Many convicts were unjustly punished for quite slight offences, and ought to have been free.

It is possible that this man ought to have been at liberty; at any rate, Vincent de Paul thought so; for, unable to bear the sight of the convict's misery, he made up his mind to do a very noble and unselfish act—to change places with the man. He knew the gaoler, and got permission to take the convict's place.

And so the chains were removed, as we see in the picture on page 3069, and put on the priest, who took his place in the gang of men. But he suffered so much from the rough life, hard work, association with criminals, and cruel pressure of his chains, that, though he was soon released, he felt the after-effects all his life.

Aided by his friend, the count, he won back the prisoners to hope and self-respect, and both worked hard to improve the prisons and galleys. Vincent de Paul devoted his life and his possessions to the service of the oppressed. He collected money, and with it bought and freed 1,200 slaves. He started the Order of Sisters of Charity who do so much good in France, visiting the sick and taking care of helpless children and aged people. He influenced for good the King and Queen of France. He got the king to persuade the Dey of Tunis to let him establish a mission to the Christian slaves of the Moors in North Africa. The Brothers of St. Lazarus, as the missionaries were called, arrived there in the midst of a plague, and nursed and helped both Christians and Moors.

It was many, many years before the English and French fleets succeeded in doing away with piracy in the Mediterranean; but it was largely owing to the interest in the matter roused by Vincent de Paul that the traffic in slaves was finally stopped.

THE APPRENTICE BOY AND HIS MASTER'S CHILDREN

AT the time when boys were apprenticed to a tradesman to learn a business or craft, a boy was learning to be a gunsmith in a port in the West of England. He was a boy whom his master trusted, for one day he left him to take care of the house and the four little children, while he and his wife went to visit a village near by.

While the boy was busy serving customers, the children were playing together in the room behind the shop. All went well until, after one man had stayed chatting some time, the apprentice thought the childish voices had been quiet a long while. He listened, but heard only a far-away little murmur.

Then he grew rather anxious, wondering where the children could be. After calling them several times, at last there came an answer, which made him run to the top of a ladder leading down to the cellar under the shop. On shouting down the ladder, the little ones told him with glee that they were playing shops, and had lighted a candle.

That might have been a harmless game, but when the apprentice heard what was going on he was filled with horror, for down in that cellar gunpowder was stored. As fast as he could, the boy hurried down into the cellar, and there he found his fears confirmed. The dangerous powder was doing duty for tea and sugar, and being put into pieces of paper, as the children had seen done in the grocer's shop.

But that was not by any means the worst of the play. The children had found a piece of candle-end, had pushed the cover of the barrel of gunpowder half off, and had placed the lighted candle-end upon it.

Any moment they might all be blown up. Here was opportunity for the display of presence of mind and great courage.

"Run and see if father and mother are coming!" cried the boy. "Make haste!"

He said just the right thing. The children loved their parents, and they were obedient. If they had not obeyed instantly, but had stopped to finish measuring out that dreadful sugar and tea, they would have been killed, for the candle was flaring down near its end. But they rose from the ground, clambered up the ladder, and ran out into the street.

The brave boy down below, protecting the candle-flame with his hands, listened intently till the patter of the little feet overhead had ceased. Then, with the greatest care, he lifted the sputtering candle-end, and though it burned his fingers, he carried it very slowly, very carefully to the foot of the ladder, and climbed into safety. His wonderful coolness and presence of mind had prevented a terrible calamity.

THE LAWYER WHO LOST HIS FEE

A SPENDTHRIFT knave who owed a merchant fifty pounds had no money to pay his debt, so was put into prison.

The man was much distressed, and, being anxious to gain his freedom, he sent for a cunning lawyer, to take up the case.

"What will you give me if I get you out of prison?" asked the lawyer.

"Oh," said the man, "I will give you five pounds, and here are the sovereigns in my hand. I will give them to you directly I am free."

"Very well," answered the lawyer, who was a great rogue. "I will take up your case on those terms. Now, you must do exactly what I tell you. When the case comes on, and the judge begins to ask questions, simply say 'Baa' like a sheep, and leave the rest to me."

Soon the merchant's case came on in the court, and the judge said to the debtor:

"Is it true that you owe this merchant fifty pounds?"

"Baa!" said the debtor.

"What do you mean?" said the judge. "Don't you understand the question, or are you playing a trick upon the court?"

"Baa!" answered the man once more.

"Will you answer the question that I am asking?" said the judge angrily.

"Baa!" replied the man again.

"How now!" exclaimed the judge. "This fellow seems to have a sheep's tongue in his head, for he answers in the sheep's language."

"Why, my lord," said the lawyer, "do you think it possible that this merchant, who is so wise and clever, would have trusted such an idiot with fifty pounds' worth of goods? I'll warrant he never did that to a knave who cannot speak."

The judge agreed, and ordered the debtor to be set free.

After the court had broken up, the lawyer went to his client and asked for his five pounds.

"Baa!" said the debtor.

"You need not cry 'Baa' any longer," said the lawyer. "Pay me my fee now."

"Baa!" said the man.

And, although the lawyer stormed and raged, nothing more than "Baa" could he get out of the man, who had learned the lesson well, and proved as artful as the lawyer himself. So was cunning paid out with cunning, and a bad man gained no reward.

THE FRIENDS WHO WERE NOT DIVIDED

ON the edge of a forest in the North grew a tall and graceful pine-tree. Its companion was a flax plant that grew in a field adjoining the forest. The pine thought the flax the daintiest plant he had ever seen, and the flax admired the tall and graceful pine as a very monarch in dignity.

As time went on this friendship grew, and the tall pine and the little flax made a vow that nothing should part them. The other trees of the forest were very indignant with the pine, and told him that it was beneath his dignity to be friendly with such a little plant as the flax; and the other plants of the field—the wheat and the thistle and the clover—blamed the flax for aspiring to be the friend of the pine.

"Do you suppose the great pine cares anything for you?" they said.

But it made no difference to the pine or the flax; each trusted the other, and the bonds between them were drawn together. But one day the reaper came, and the flax was gathered and taken to a factory, where it was changed into rope and cloth.

"Ah," said the trees to the pine, "you have lost your companion, and will never see her again!"

A few weeks later men came with saws and hatchets and cut down the great pine-tree. It was carried to a wonderful yard near the sea, where a fine ship was being built, and soon the pine was standing as a mast on the deck of the ship.

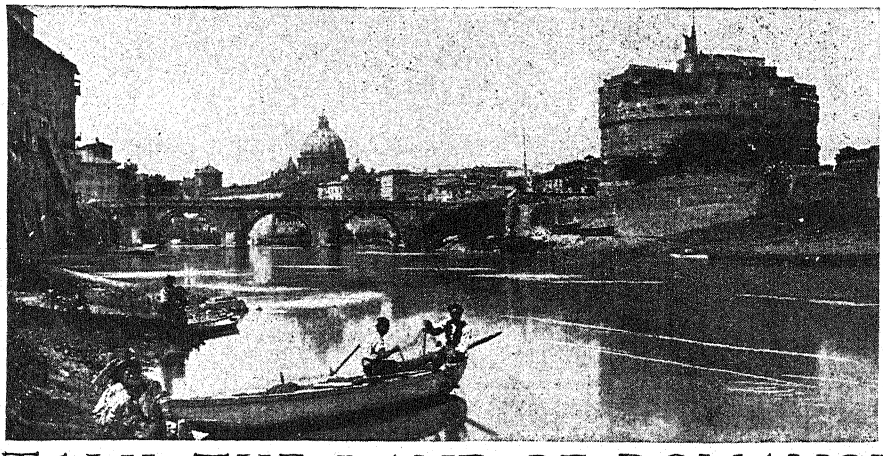
Presently men came aboard the ship carrying a great bundle, which they laid on the deck at the foot of the mast. Then they untied the ropes that held the bundle together, and began to unroll a fine sail of white cloth. Ropes and pulleys were fixed to the top of the mast, and the sail was pulled up and fastened there. Then the bottom of the sail was placed in position, and soon the wind caught the sail, the mast strained, and the great vessel began to move out of the dock. The mast held up the sail, and the sail helped the mast to carry the ship along; and as the vessel passed out of the harbor there was a song of joy, for once again the tall pine and the graceful flax were united. The sail and the ropes had been made from the little flax that grew on the edge of the forest!

THE NEXT GOLDEN DEEDS ARE ON PAGE 3235.

ITALY, THE LAND OF SUNSHINE AND SNOW



Italy has the curious appearance of a man's leg and foot about to kick Sicily through the Straits of Gibraltar into the Atlantic. The country is very mountainous, for down the middle run the snow-clad Apennines, and in the north the towering Alps act as a protecting barrier against invaders. Hannibal and Napoleon, however, found the Alps no bar to their conquering progress. When Austria ruled in Italy, an Austrian statesman said that Italy was merely "a geographical expression," meaning that this country united under one sovereign and one government was unthinkable. But half a century later the apparently impossible was realized, and Italy is now one country not only geographically, but one in thought and action.



ITALY, THE LAND OF ROMANCE

CONTINUED FROM 2992



The King of Italy.

INTO the blue, tideless Mediterranean Sea three large peninsulas point southwards. They are the Iberian Peninsula, consisting of Spain and Portugal, very solid in shape, on the west; the Balkan Peninsula, with its very jagged coasts, on the east; and between them lies the long, narrow peninsula of Italy, in shape very much like a fisherman's boot. At the point of the toe is the island of Sicily.

Let us look well at the shape and position of Italy, for they have largely influenced its story. Owing to its long, narrow shape, the various districts have always been much cut off from each other, and with its immense coast-line no part of Italy is more than seventy miles from the sea. Its central position gives it command of both the east and west basins of the great inland sea, as well as the keys of the passes in the Alps, which separate the northern part of the country from Central Europe.

Hence, in the very far past, when the "world" consisted of the countries bordering the Mediterranean and the great nations of the East in Asia, Rome, in the middle part of the middle peninsula, gradually rose to be mistress of that world. Later, all through the years when the European countries were growing into their present shapes, continual wars were waged for the possession of the country whose "gates" were so important both for trade and for conquest.

We read on pages 2984 and 2992 of these passes over the Alps, and of the wonderful tunnels that have been made right through the mountain masses, by which trains now pass rapidly from France and Switzerland into Italy. Wonderful and interesting as it is to rush through these long tunnels, the more beautiful way to enter Italy is the old way over the passes, which people often do now by motor-car. It is a steep climb out of Switzerland, by zigzag roads, ever up and up, and in and out through beautiful valleys, by the slopes of great hills, with their forests and waterfalls.

Then comes the region of snow and ice, and at the top of the pass a pause must be made to enjoy the view of the mountains sloping down to the great level plain beneath, whose green pastures and woods, watered by the River Po and its tributaries, melt into the blue haze of the far distance. Descending into Italy, the snow and rocky heights are left behind, and the travelers pass into a soft, warm air and a smiling, sunny country, where bright flowers make gay with color the little white villages and fine villas, and fruitful vines grow twined round mulberry

trees, and luxuriant orange and lemon groves give out their sweet, faint scent.

We can see from the map how the great sheltering Alpine range circles round this wide north plain of Italy from Austria to France. The high land then becomes the chain of the Apennines, which bound the south of the plain, separating it from the Gulf of Genoa, and then, turning southwards, run throughout the entire length of the peninsula for some 800 miles, and end in the wonderful volcano, Mount Etna, in Sicily.

The green, round-topped Apennines are little more than half the height of the Alps, and on them grow pines and chestnuts; flocks and herds feed on the pastures, and in the fields grow all kinds of crops. The position of the range, more or less near the middle of the long peninsula, gives but little room for the course of the rivers. Most of them run down straight to the sea, but in the western plain, where the mountains lie near the east coast, there are two famous rivers, rather longer than the others, the Tiber and the Arno.

THREE FAMOUS RIVERS ON WHOSE BANKS STAND MANY SPLENDID CITIES

The Tiber is about 50 miles shorter than the Hudson. On it stands Rome, so old and so grand that it is called the "Eternal City." On the Arno stands beautiful Florence—the city of flowers—of whose glories we read on page 2787. It is only in the north continental part of Italy, in the wide plain encircled by the Alps and Apennines, that there is room for a long river such as the Po to travel over 400 miles from its source, on the borders of France, to its mouth, in the Adriatic Sea. There are many splendid towns in the basin of the Po, and it has always been a fertile and flourishing district, except when ruined by cruel wars; for, in addition to its warm climate, it is well watered and served by its large river, navigable for 200 miles, and its many tributaries. Steamers pass to-day from the sea to the beautiful lakes of Maggiore and Como, which, with many others, nestle round the feet of the giant Alps. Poets and painters delight in the wonderful scenery of these lakes, which attract thousands of visitors every spring, when east winds are raging in North Europe, and summer seems very far off. But summer comes early south of the Alps, and it is indeed a joy to go in a boat on the blue lakes and look up at the crags and white peaks, or follow the winding roads among the woods at their edges, or sit still in a lovely garden overlooking all this beauty, softened, as it often is, by a dreamy golden haze.

A PROSPEROUS AND UNITED KINGDOM NOT YET FIFTY YEARS OLD

To-day, this country of the great north plain, and the long peninsula, with its backbone of mountains, together with the islands of Sicily and Sardinia, form one united kingdom, about twice the size of the State of Florida, and the city of Rome is its capital. The real beginnings of Rome lie more than 2,500 years back, and we read of the old Roman Empire in another part of this book, but the united kingdom of Italy to-day is not yet fifty years old. As we study the map of Italy, we notice that there are various provinces, such as Lombardy, with Piedmont and Venetia each side of it, in the north; Tuscany, Campania, Calabria, and several others in the peninsula itself. These are the survivals of the many different states which existed in the past, sometimes independent, sometimes crushed under neighbors or foreigners, but never really united under one ruler from the days of the grand old Roman Empire until 1870.

We remember in the story of Great Britain, told on page 212, how hurriedly and urgently the Roman soldiers were called home from the walls and camps of Britain to defend not only Italy, but the great heart of the empire, Rome itself, against the wild hordes who were then streaming down the peninsula. These Goths entered the splendid city, and did so much damage to it that to this day we speak of a rough person, who does not understand or care for beautiful things, as a Goth.

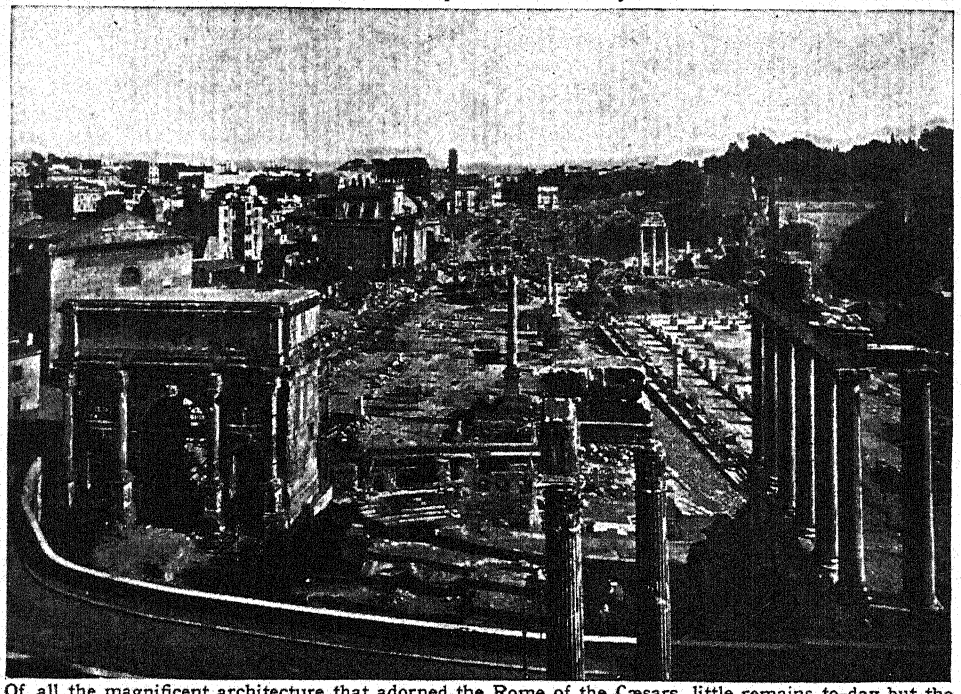
HOW THE FIERCE GERMAN TRIBES SWEPT THROUGH THE WHOLE LENGTH OF ITALY

Before this calamity, the empire had been divided into two branches, Rome remaining the capital of the Western emperor, Constantinople, or Byzantium, becoming the capital of the Eastern emperor. Presently the line of Western emperors came to an end, and the Eastern emperor appointed an officer to rule for him over the West. And so the old empire became less and less able to resist the wild enemies that poured in on the unhappy country.

ROME OF TO-DAY AND ROME OF THE PAST



Even in ancient times, Rome, the city of the seven hills, was known as the Eternal City. As the centre of the Roman Empire, she was for centuries mistress of the world; and though that empire fell, the Rome of the popes still ruled the nations. Now, however, she is simply the capital of Italy, and the spiritual centre of the Roman Catholic Church. Here we have a panorama of the city as seen from the dome of St. Peter's.



Of all the magnificent architecture that adorned the Rome of the Cæsars, little remains to-day but the ruined Forum. The Forum was the centre of Rome. Here, with temples and tokens of triumph all around, the people of the world-conquering nation used to meet and declare their will. Now the scene, as shown in this picture, is a mass of ruins, buried for centuries and now revealed, emblem of a departed empire.

There were the Lombards, a German or Teutonic tribe, ever pressing southwards from the Elbe to the Danube, and thence into the rich north plain of Italy, which is called after them to this day. One of their victorious kings marched right down the country to the very point of the toe of the "boot," and, touching with his lance a column on the seashore, said, "Thus far shall stretch the bounds of the Lombard kingdom."

THE POWER OF THE ANCIENT EMPIRE WANES AND THE POPES GROW STRONGER

But he was mistaken; the Lombard kingdom lay chiefly in the basin of the Po. The wisdom and noble-mindedness of the Bishop of Rome of those days—he was the sixty-fourth since St. Peter—kept the Lombards in check for a time. This was Gregory the Great, the man who had felt such pity for the beautiful Angle children, desolate in the slave market, where they were exhibited. He accustomed the people to the idea that the head of the Church could also look after the affairs of State, and so it came to pass that, as the old power of the ancient empire flickered out, the new power of the Bishops of Rome began to grow.

We have seen, on page 2552, the popes who succeeded Gregory calling in the help of the Franks against the Lombards, and this led to Charlemagne, their king, being crowned Emperor of the Holy Roman Empire by the pope. It was a kind of revival of the title that was dead and gone, but the power was never the same as of old.

In the centuries after Charlemagne many foes descended on the long, narrow peninsula, which received but little help from the shadowy emperors, who lived chiefly across the Alps.

HOW THE EASTERN TRIBES AND NORMAN SEA-ROVERS OVERRAN THE SOUTH

There were the Mohammedan Saracens, or Arabs, who overran the southern lands and the beautiful island of Sicily, and plundered the rich cities they found there. The Magyars, or Hungarians, made many inroads on the north before they were driven back and made to settle round about the Danube.

Then, about the time when Duke William of Normandy was planning the conquest of England, other Norman leaders brought bands to South Italy and Sicily, and won nearly all the lands that still owned the sway of the Eastern emperor. To this day the beautiful round-arched Norman churches, like those in the north of France and in England, speak of the presence of these daring sea-rovers in the far Sunny South.

There was little peace in those days. The various states of Italy were generally at war, and bent on seizing each other's dominions, and they cared less and less to have a German emperor over them. The tie was a very loose one, though occasionally there was a grand coronation at Rome, and the stronger emperors, such as Barbarossa, now and then came over the Alps with German soldiers to try to master their Italian subjects. But the power of the Church, from its head to the lowest of its clergy, went on steadily increasing. Great possessions were left to the popes, so that in time they ruled over a large tract of country, the Papal States, or States of the Church, and large estates everywhere fell to the bishops and abbots. Then, as the clergy were better educated than most of the people, and more fitted for public business, by degrees they filled all the chief offices of State.

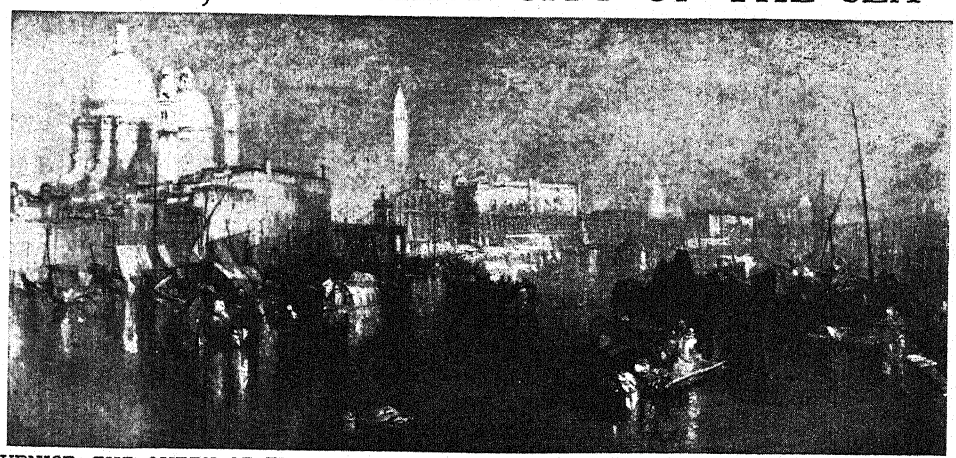
THE RISE OF THE GREAT TRADING CITIES AND WHAT THEY DID FOR ITALY

We have seen in the history of Germany how soon the popes and emperors began to disagree. There was Henry IV. at Canossa, of whose submission we read on page 2554, and Barbarossa at Venice; indeed, for centuries the chief part of the history of the times is the account of the quarrels between the two heads of Christendom.

From the tenth century onwards the great cities of Italy played a large share in its story. When so many wars and disputes were going on, it was necessary to fortify and hold them against one side or the other, and often they managed to get privileges given or confirmed as a price for their help, till at last they became practically free, and governed themselves. They became, too, very rich from trade as the years went on, and splendid cathedrals rose up, as well as magnificent palaces and houses, all filled with the works of art that have made Italy so famous.

Let us turn now to the chief of these old towns, to read in them the many-sided story of the Middle Ages in Italy.

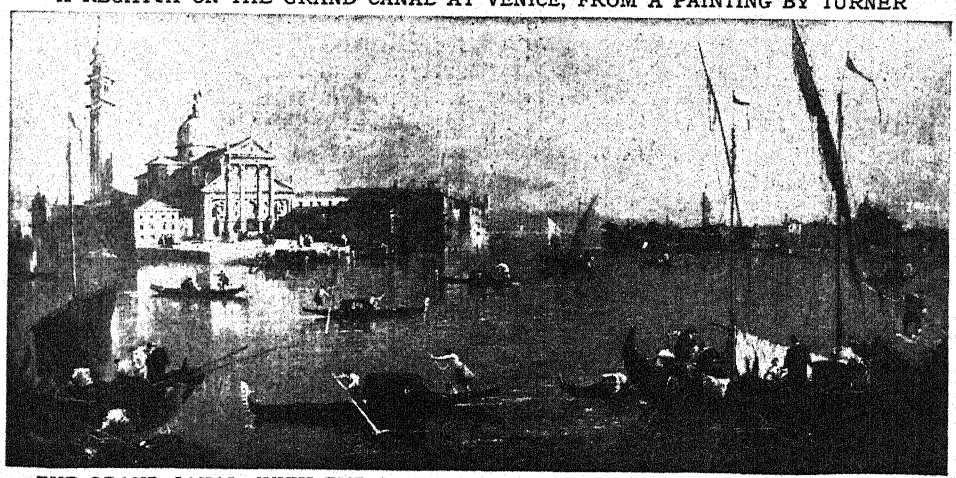
VENICE, THE FAIRY CITY OF THE SEA



VENICE, THE QUEEN OF THE ADRIATIC, AS PAINTED BY THE ENGLISH ARTIST, TURNER



A REGATTA ON THE GRAND CANAL AT VENICE, FROM A PAINTING BY TURNER



THE GRAND CANAL, WITH THE CHURCH OF SAN GIORGIO MAGGIORE ON THE LEFT

Venice is one of the most wonderful cities in the world. Its splendid palaces and churches rise from the salt waters of the great lagoons near the Adriatic Sea like a picture of fairyland. Its canals are alive with gondolas, its queer little streets crowded with people; its domes and towers shine and glisten in the glorious sun against a sky of radiant blue. This was just the place for fairy stories to come from, and here, four hundred years ago, many of the favorite fairy tales were first written and printed.

The photographs on these pages are by Messrs. Russell & Sons, Underwood & Underwood, London, Hanfstaengl, Mansell, Anderson, & Alinari.

We will start in the Plain of Lombardy with Milan, connected by canals with the River Po and Lake Maggiore. Here the Lombard kingdom was overthrown by Charlemagne. Three centuries later, Barbarossa utterly destroyed the city. But it rose again, and early in the fifteenth century the beautiful cathedral, of which we see a picture on page 609, was built.

THE DAZZLING WHITE BEAUTY OF ONE OF THE WONDERS OF THE WORLD

One can well believe that the snowy pinnacles of the Alps inspired the architect with the idea of this wonder of the world in white marble, with its slender shafts and sharp spires gleaming in the sunshine. Thousands of statues and the richest sculpture cover it from pavement to tower, and the dazzling beauty of the whole reminds one of a glorious piece of frost work. Palaces and monuments tell of the taste and power of the princely families who kept brilliant courts at Milan at the time of its greatest fame. In the sixteenth century Milan and the country round fell to Philip II. of Spain, son of the Emperor Charles V. During the War of the Spanish Succession it passed to the House of Austria, who kept it till the middle of last century, except for the few years influenced by Napoleon.

On the way to Genoa we pass Pavia, the old capital of the Lombards, situated where the River Ticino falls into the River Po. In a very old church here, Barbarossa and other German sovereigns of the Middle Ages were crowned with the famous old Lombardy crown, in which is an iron fillet said to be made from one of the nails of the Cross.

THE BOLD SAILORS OF GENOA WHO DEFIED A FRENCH KING

Genoa lies on the sunny slopes rising from the Mediterranean. It had a long and eventful history before the time of the Crusades, when a busy trade arose with the eastern part of the Mediterranean—the Levant. Its merchants became very rich, and a beautiful cathedral, with the front of black and white marble, was built, as well as many other churches and fine palaces. The Genoese were brave and daring sailors, and many settlements were made by them round distant parts of the Mediterranean. They had many struggles with Venice, which sorely defeated them at the end of the fourteenth century. The famous Christopher Columbus was born at Genoa, and many other seamen of the town found their way out of the narrow Straits of Gibraltar to the opening-out world of the South and West. For many years the city was torn in two by the quarrels of the great families who ruled it, and the Turks finally conquered its Eastern possessions as its power went down. But there was still a bold spirit left in the Genoese. When Louis XIV. commanded their alliance they refused, and did not submit till their city had been cruelly bombarded. A century later, Napoleon first formed it, with the land round it, into the Ligurian Republic, and then annexed it to France, after which it was joined to the kingdom of Sardinia.

Its great rival, Venice, lies on 117 small islands in a shallow bay on the north of the Adriatic. Its first inhabitants had fled to this retreat to be out of the way of the savage invaders who swept into the fruitful north plain. They became sailors and traders, and their city and territory grew rapidly, for, owing to its position, it became a depot for trade between East and West.

VENICE, THE WONDERFUL FAIRY CITY THAT RISES FROM THE SEA

No labor has been too hard for the Venetians; they drove strong piles into the muddy islands, and when the foundation was strong enough they built on it houses, and, as time went on, palaces of stone and marble, enriched by sculpture and work in mosaic, such as we see on page 3079, and stored with paintings and treasures of every kind brought home by their ships from the East. There are now nearly 400 bridges over the 150 canals which form the "streets" of this marvelous city. Boats are its carriages, for the water washes the very doorsteps of its houses.

From the large square, or piazza, before St. Mark's, there is a fine view of this cathedral, of which there is a picture on page 609. It has no towers, no spires, but, after a fashion borrowed from the East, is crowned with domes. There are hundreds of marble columns and splendid statues, and over the chief portico rear four fine gilded bronze horses, brought to Venice by one of the Doges about the time King John of England was struggling with his barons

A FAMOUS PICTURE MADE IN MARBLE



This famous picture of St. Mark is made of marble. It is what we call a mosaic, one of the most wonderful triumphs of the artists. The secret of mosaic is the putting together of thousands of tiny pieces of marble or glass of many colors so as to make pictures or patterns. Some of the noblest pictures in the world are in mosaic; there is a picture in St. Peter's at Rome which took ten men nine years to make in this way. The inside of St. Mark's at Venice, where this picture is, is nearly all mosaic, and contains some of the finest pictures in the world, made in marble of natural colors without any paint. There is a mosaic factory at Rome where men copy pictures for churches, and the colored glass they use is said to have 28,000 different shades.

about Magna Carta. These horses have a wonderful story. They were made by an unknown artist in Greece, and were taken to Rome, where they crowned the triumphal arches of two emperors; they were taken from Rome by Constantine, to his new capital, Constantinople; they were brought back to Italy by a Doge of Venice; they were carried away to Paris by Napoleon, and afterwards given back to Italy. These horses have thus adorned four of the world's greatest cities, and to-day they add glory to one of its most glorious buildings. The inside of St. Mark's is even more wonderful than the outside, with the gold mosaic of the domed roof and the many-colored marbles of the floor and walls.

THE EVIL DAYS THAT CAME TO VENICE, AND THE FAME OF BOLOGNA

The Palace of the Doges is close by, and one likes to imagine the glorious processions as the Great Duke or Doge, head of the Republic, wended his way in state to the cathedral, or to his magnificent barge when he went each year to drop a precious ring into the ocean, to show the close union between Venice, the Queen of the Adriatic, and the sea.

But evil days came to beautiful Venice as well as to the rest of the Italian cities. It passed the height of its glory after its bitter war with Genoa, when its fleets commanded the Mediterranean. The Turks were for a long time cruel enemies, and the discovery of the sea routes to India lessened its trade. For many years, too, there were great conflicts to be faced with Austria, Spain, and France. In the struggles between France and Austria, in Napoleon's time, Venice was seized and given to Austria. It was fifty years before it regained freedom, but in 1848 it once more became a republic, and in 1866 was united to Italy.

On our way from Venice to Florence we pass many interesting old cities, famous for their cathedrals and universities, and other relics of the past.

FLORENCE, THE WONDER CITY OF THE MIDDLE AGES

Amongst them is Bologna, a very old and rich town. Students from every part of Europe flocked to its famous university as far back as the times of the Norman Conquest. Long quarrels between the nobles who ruled the city were at last ended by the popes adding it to the States of the Church. Florence lies among the spurs of the Apennines by the River Arno, on the great route from Upper Italy to Rome. Vineyards and orchards and cornfields surround it in peace now; long ago, both streets and countryside echoed with the shouts and cries of battle, when the great rival families of the Guelphs and the Ghibellines struggled to be first. In the midst of the din, full three hundred years before Shakespeare lived in England, another great world poet, Dante, lived and wrote in Florence. At last the merchants, so successful in industries such as wool, silk, and fur, put an end to the ceaseless conflicts by taking the government in hand. A time of prosperity then set in, during which Florence was looked upon as the money market of Europe. A great family called the Medici had immense influence not only in Florence and Rome, but in Europe beyond. They were clever, and did not mind what means they used to gain their ends, but their rule promoted progress.

Florence is one of the most wonderful places for art in the whole world, and we read about the great men who made it so on page 2787. The Medici kept their power till Tuscany passed under the power of Austria near the middle of the eighteenth century.

ROME, THE ETERNAL CITY, AND THE GREAT CHURCH OF ST. PETER

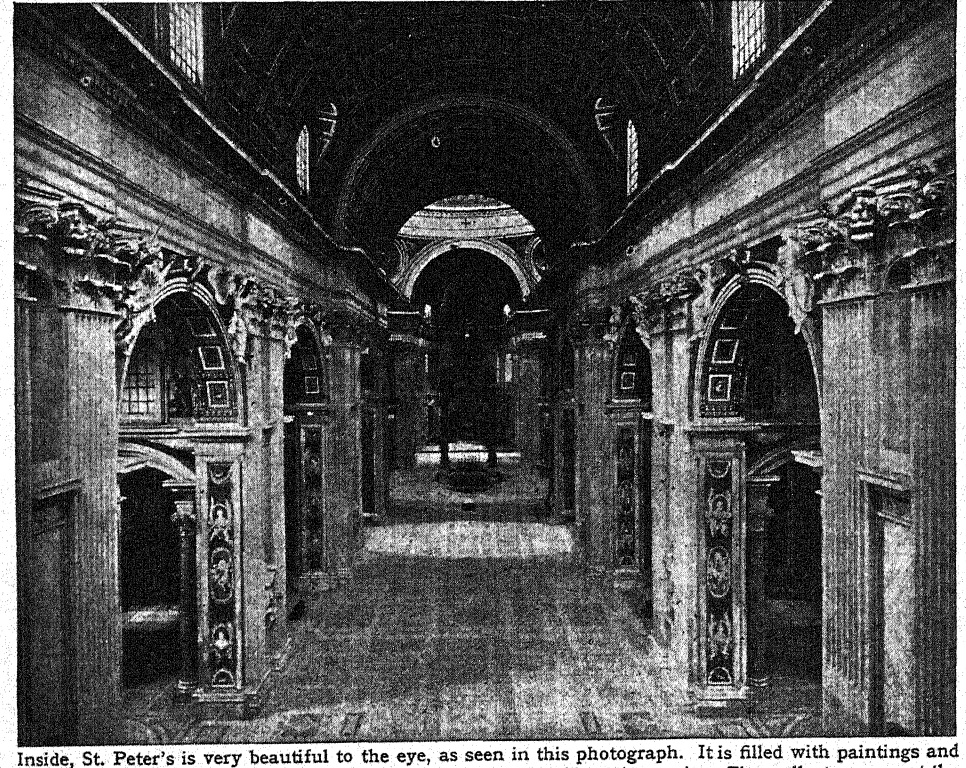
A near neighbor of Florence, and also on the Arno, is Pisa, famed for its leaning bell-tower, of which there is a picture on page 319. It has stood over 800 years, a vast, hollow pillar nearly as high as Bunker Hill Monument in Boston. It has been well said that "It looks like some fairy tower, composed of tier upon tier of marble columns and delicate tracery, and leans gently forward as though weary of the burden of its own beauty."

But "all roads lead to Rome," and from all Christendom thousands of pilgrims have made their toilsome way to visit the spots believed to be hallowed by the presence of the Apostles St. Peter and St. Paul. The greatest Christian church in the world stands on what is said to be the site of St. Peter's tomb. Over 150 years were spent in building it, and two of the most famous artists ever known — Raphael and Michael

THE LARGEST CHURCH IN THE WORLD



St. Peter's Cathedral at Rome is so large that most cathedrals could be placed inside it, and still leave a great deal of room. The foundation stone was laid in 1506, but the building was not finished until 1667, and among the many architects were such famous artists as Raphael and Michael Angelo. As a specimen of architecture, however, St. Peter's has been spoiled by so many different men mixing up different ideas.



Inside, St. Peter's is very beautiful to the eye, as seen in this photograph. It is filled with paintings and sculptures by great artists, and the immense dome is decorated in rich mosaic. The walls, too, present the appearance of being faced with different colored marbles; but this is only a pretence, for they are really covered with plaster painted to look like marble. A splendid altar of brass stands beneath the dome.

Angelo—helped with their designs. A mighty flood of light pours down on the marble floor of the immense building, showing up the fine statues, tombs, and pictures for which it is so famous. The foundation of this St. Peter's of to-day was laid when Henry VIII., whose action parted England from Rome, was a young man, early in the sixteenth century. It took the place of the church which had lasted 1,000 years, and had seen the coronation of Charlemagne and many stately ceremonials of the earlier popes, all through the years when so many English bishops had to journey to Rome to receive the tokens of their office.

The Vatican Palace close by has been used by the popes since the days when the Papal Court returned from Avignon, where it had been held for seventy years. This was at the end of the fourteenth century. The palace now contains about 1,000 halls, chapels, and rooms, and the greater part of it is used to house the splendid collections of books and works of art that have been gathered together by the popes.

THE RUIN WROUGHT BY THE WARS, & THE PILLAGE OF ROME BY FOREIGN TROOPS

They were troublous times for Rome while the popes were away at Avignon, in France; great families, as in other cities, struggled for power; there was constant fighting in the streets, and at last the people were stirred up by Rienzi to try to restore ancient liberties. But he was slain in a tumult. Even worse days were in store when Francis I. and Charles V. were fighting all over Italy. The extravagance and ambitions of some of the popes had almost ruined their states, and at last the army acting for Charles V. arrived before Rome and stormed it. The pope escaped from the Vatican to the strong fortress of St. Angelo, one of the splendid remains of the old Roman Empire, and for seven months the soldiers worked their wicked will in the old capital of the world. Pictures and statues beyond price were destroyed, books burned, and the inhabitants treated with the greatest cruelty. This barbarism, however, aroused Francis I. and Henry VIII., and they made Charles withdraw the soldiers.

Three years later, however, Charles, who had made peace with the pope, was crowned by him at Bologna.

Another despoiling of Rome took place when Napoleon Bonaparte, a man of Italian blood and name, pursued his career of conquests down the long peninsula. He made the pope give up part of his land and pay tribute, and send to Paris some of the most precious treasures of the Vatican. Throughout Italy Napoleon turned states and rulers about as he chose, forming republics, and duchies, and kingdoms in turn. At this time the bronze horses of St. Mark's, Venice, made a long journey to Paris, and when the pope dared to complain of his treatment, Napoleon carried him off also, a prisoner to Paris.

THE KINGDOM OF NAPLES AND SICILY, AND THE TERROR SPREAD BY BRIGANDS

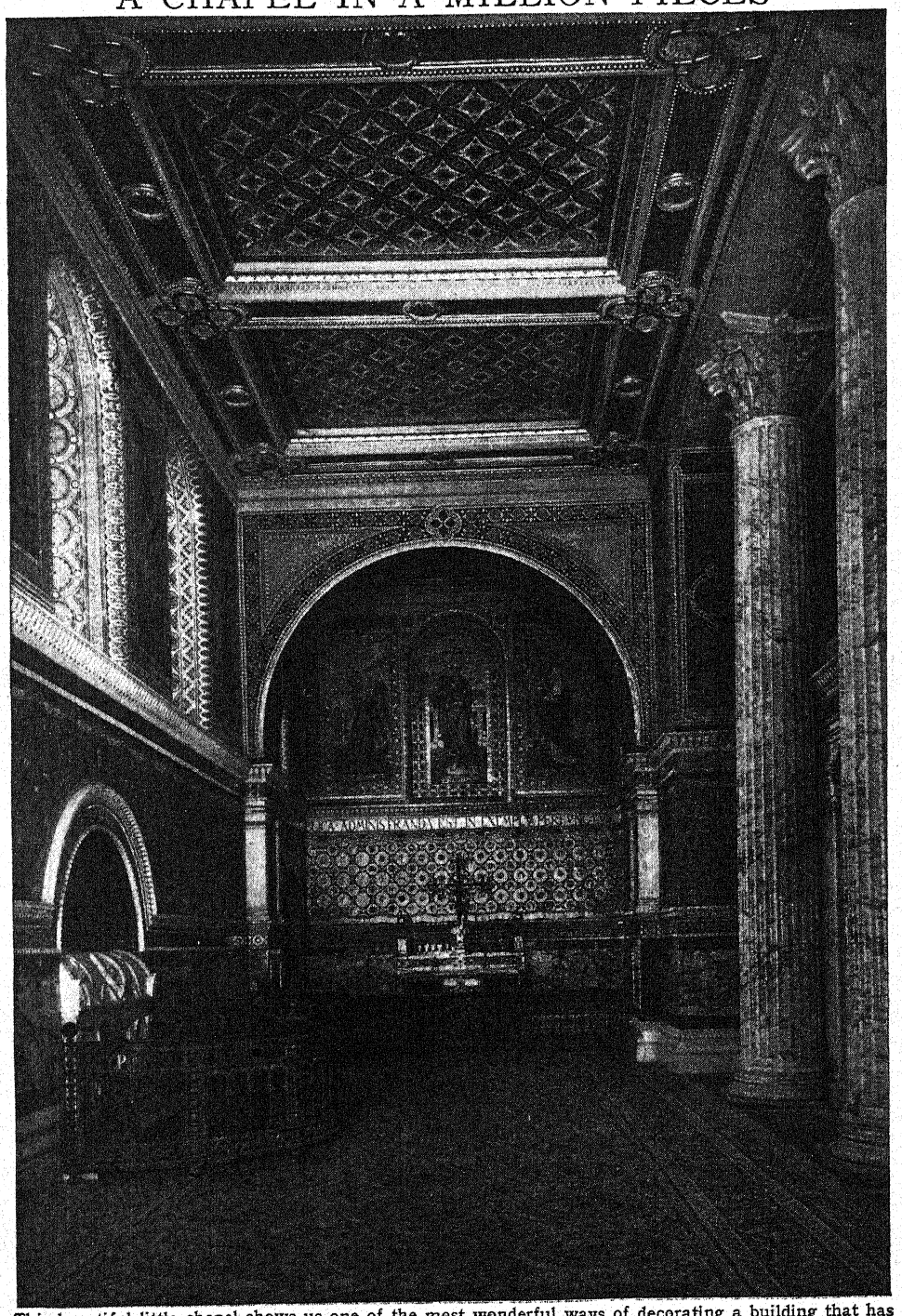
Napoleon did not stop at Rome. Naples, the most beautifully situated city in Italy, and capital of the southern lands, had its full share of changes and French rulers. Perhaps of all the divisions of Italy, the changes in the south through the centuries have been the greatest and most bewildering. When the line of Norman kings ended, the German emperors had full sway for a time. Then princes of the House of Anjou were followed by Spanish rulers, then Naples fell to the Austrian Hapsburgs, and then again to another French family. Many and grievous were the wars and revolts, oppressions and hardships, so that the kingdom of Naples and Sicily had no chance of making progress like the rest of Italy, and the people were kept very poor and ignorant, and in many parts, especially in Sicily, wild and fierce brigands roamed about, making life unbearable in this most lovely part of the world, where the blue, shining sea ripples and washes round the shores of lovely rocky bays.

THE ISLAND THAT GAVE MODERN ITALY ITS FIRST KING

The island of Sardinia, lying in the middle of the western basin of the Mediterranean, was attacked in turn by Goths and Saracens, the Eastern emperors, and the popes. Later, it fell to the rulers of Savoy and Piedmont, and their united states were called the kingdom of Sardinia. This kingdom gave modern united Italy its first king.

After the fall of Napoleon, the Congress of Vienna set many of the Italian princes back in their states, and Austria was the chief gainer. So things went on

A CHAPEL IN A MILLION PIECES



This beautiful little chapel shows us one of the most wonderful ways of decorating a building that has ever been invented. It is what we call "mosaic," a thing made up of little pieces. The chapel is made of marble from floor to ceiling, and the patterns and pictures that we see everywhere are not painted, but are part of the floor and walls and ceiling, which are built by putting together thousands and thousands—there must be over a million—of little pieces of marble and glass. In the cleft in the wall lies one of the Popes. They buried him first in St. Peter's, but as he had wanted to lie among the poor, they built this little chapel, one of the most beautiful little chapels in the whole world, in the poor streets of Rome.

ITALY'S GREAT STRUGGLE FOR UNITY



With their country split up into many badly governed states, the people of Italy longed to be a united nation. All agreed that the first step was to drive the Austrians out of Italy, and several unsuccessful attempts were made to do this; but in 1859 Sardinia, with the help of France, defeated the Austrians at Palestro.



Four days after the battle of Palestro, the Austrians were again severely beaten at Magenta by the French, and the Emperor Napoleon III., with the King of Sardinia by his side, made a triumphal entry into Milan.



The success of Sardinia roused enthusiasm all over Italy, and the demand for unity became universal. The Austrians again suffered defeat at Solferino, and Napoleon was acclaimed victor on the battlefield, as shown here. But he became jealous of Sardinia, made peace with Austria, and fought to prevent the Italians taking Rome. It was not till 1870 that Italy really became a nation, with Rome as its capital.

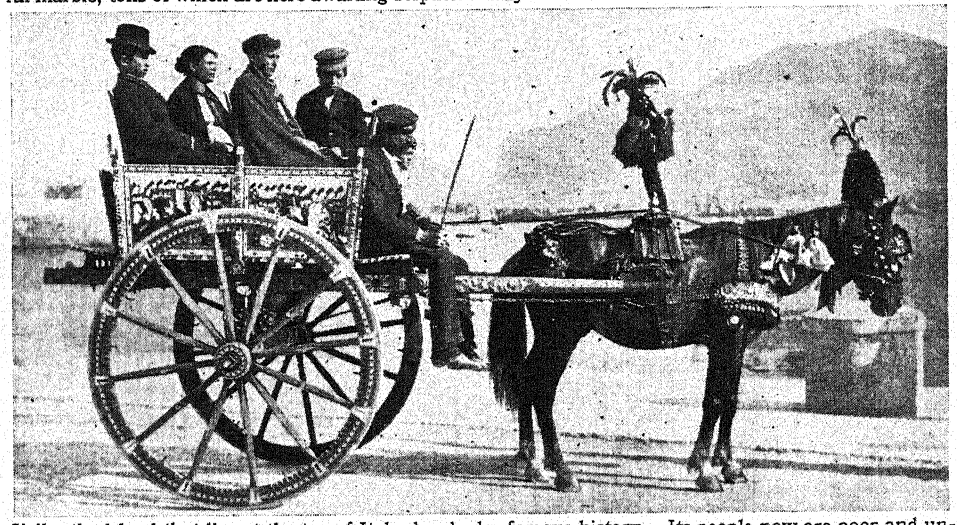
EVERYDAY SCENES IN SUNNY ITALY



For centuries Carrara has been famed for its wonderful marble, tons of which are here awaiting despatch.



Cattle drag the marble from the quarries to the railway. The world's finest statues are of Carrara marble.



Sicily, the island that lies at the toe of Italy, has had a famous history. Its people now are poor and uneducated. They have quaint customs, one of which is to decorate their carts with paintings, as shown here.



Macaroni, which is made largely at Naples, consists of flour and water. It is made by machinery, and while still wet is hung in the streets to dry.



In Naples the poor people are called the lazzaroni, after Lazarus, the poor man in the Gospel. The picture represents a typical scene in the poor district.

Two upper and two lower photographs copyrighted by Underwood & Underwood, N.Y.

for a time much as before the turmoil and upheaval. But there was a difference.

The desire that all the different states of Italy should be formed into one free Italian nation, governed by an Italian king, was now beginning to grow in different parts of the country, especially in Piedmont, one of the Sardinian states. But all conspiracies and insurrections were kept down by Austria and the princes supported by that Power.

THE MAKERS OF MODERN ITALY

One of the early leaders of the people seeking for liberty was the patriot Mazzini, and one of the great things he accomplished was that he made his countrymen believe that the freedom and unity of Italy were possible. In the revolutionary year of 1848 most parts of Italy rose. Rome and Venice became commonwealths for a short time; Milan rose against Austria; but success was not yet. The Austrians and French put down freedom everywhere, and Venice was returned to Austria. More than ten years of hard effort were needed before the King of Sardinia could be called King of Italy; then, in 1866, when Austria was at war with Prussia, Austria had to give up Venetia—she had lost Lombardy some years before. The French kept troops in Rome until the troubled time of their war with Prussia, when they could no longer be spared.

Then Rome, too, was taken, and became at last the capital of Italy. Among the great names in this wonderful struggle for freedom, besides that of Mazzini, are those of Garibaldi, the brave and daring leader who raised troops and worked early and late to free his country; the king, Victor Emmanuel, who earned the title of "the honest king" because he steadily kept his word to all the parties; and his Minister, Cavour, whose wise counsels helped to settle all difficulties with the countries of Europe. The story of the freeing of Italy is one of the most thrilling that can be written.

VICTOR EMMANUEL IS DECLARED KING OVER A UNITED NATION

We read how the pope fled in disguise from Rome on the box of a carriage; how the citizens of Venice took shelter round St. Mark's against the Austrian cannon; how Louis Napoleon helped and hindered, and took Savoy and Nice for his pay; how Garibaldi freed Naples and Sicily from the tyrant who bombarded Messina and Palermo, and who caused his own people to be shot down in the streets. When King Victor Emmanuel entered Rome in state on July 2, 1871, he received an enthusiastic welcome; but the pope shut himself up in the Vatican quarter, and refused to acknowledge the kingdom of Italy. Ever since that time each pope has shut himself up and refused to leave the Vatican.

Italy has steadily made great progress since the union. There are now in it over thirty-four millions of people, who have an increasing share in the government; education is improving; also trade and industries, as roads have been developed, and railways and telegraphs connect the most distant parts with each other and Europe beyond. Many parts of the country have been drained, and so made both profitable and healthy. In the great cities there are new streets and squares, and a growing sense of order, and quiet, and responsibility, only possible when a country is free.

THE RETURN OF PROSPERITY TO THE FAMOUS OLD CITIES OF ITALY

So now Milan, "The Grand," to-day is also the chief railway centre of the northern plain, and the wealthiest manufacturing town in Italy, chiefly making silk, woolen, and cotton goods.

Genoa, "The Superb," is now the chief seaport of Italy, with great docks, and shipping. Goods are sent thence *via* Turin by the Mont Cenis Tunnel, or through the St. Gothard *via* Milan.

Venice, "throned on her hundred isles," is also a busy port, with shipbuilding yards and manufactures.

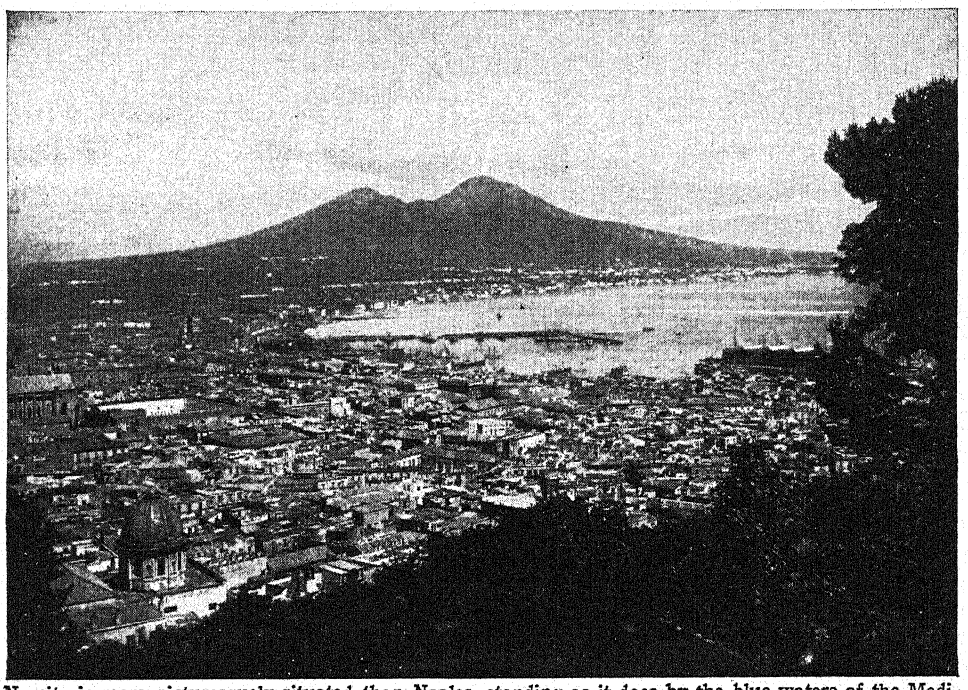
Florence, "The Beautiful," has become an industrial centre, making silk and jewelry; and Leghorn, its port, trades in corn, wine, and olive oil.

Picturesque Naples, now the largest city in Italy, is a centre for trade, and also the chief naval and military station, for Italy has rapidly developed one of the finest navies in Europe, to protect not only her own sea-coast, but her growing colonies on the east and north of Africa.

The population of Rome itself has increased very rapidly since 1870, and now numbers nearly 600,000, and a great modern town has grown up beside the ruins of the "grandeur that was Rome," and the wonders of the Middle Ages.

THE NEXT STORY OF COUNTRIES IS ON 3185.

BEAUTIFUL NAPLES AND BUSY GENOA



No city is more picturesquely situated than Naples, standing as it does by the blue waters of the Mediterranean, with the threatening crater of Vesuvius frowning upon it, and belching out clouds of smoke as though to remind the people of the fate of Pompeii, close by. But Naples is not only beautiful; it is a great centre of trade, an important naval and military station, and the largest city of modern Italy.



Viewed from the sea, Genoa seems to merit its name of "Genoa the Superb." But a closer view does not confirm this impression, for the city is not really beautiful. Although it has some fine churches and palaces, the city is built awkwardly, and consists of narrow, irregular streets. It is, however, the greatest commercial seaport in Italy, and does a large trade. Genoa is famous as the birthplace of Christopher Columbus.

THE COMPANY AT THE MAD TEA-PARTY



ALICE WITH THE MARCH HARE, THE MAD HATTER, AND THE SLEEPING DORMOUSE

There was a table set out under a tree, where the March Hare and the Hatter were having tea; a dormouse was sitting between them fast asleep, and the other two were using it as a cushion, resting their elbows on it, and talking over its head. "No room! No room!" they cried out when they saw Alice coming, "There's *plenty* of room!" said Alice indignantly. And she sat down in a large armchair at one end of the table.

ALICE'S ADVENTURES IN WONDERLAND

HERE we follow Alice further in her many and strange adventures in Wonderland. It will be remembered that she had just escaped from the house of the White Rabbit, after having eaten the little cakes which made her so tiny that she could get through the very little door of the house. She then ran into a thick wood where she would be safe until she could decide what she would next attempt to do, for she was only three inches high now, and wished to grow a bit! What happened after this is told in the following pages.

THE MAD TEA-PARTY

CONTINUED FROM 2963

ONCE in the wood she was anxious to get back to her right size again, and then to get into that lovely garden. But how? Just then she saw an enormous puppy looking down at her from among the trees. She held up a stick for it to catch, and the next moment it was playing with great delight; but as Alice was so small and the puppy so large, she was in danger of getting hurt by it, so she escaped when it was out of breath. If she could only get something to eat or drink, she was sure something would happen to her. Peeping over a mushroom, she beheld a large blue caterpillar sitting on the top with its arms folded, quietly smoking a long hookah, and taking not the smallest notice of her or of anything else. At length, in a sleepy sort of way, it began talking to her, and she told it what she wanted so much—to grow to her right size again.

"I should like to be a *little* longer," she said. "Three inches is such a wretched height to be."

"It is a very good height indeed," said the Caterpillar angrily, rearing itself upright as it spoke (it was exactly three inches high).

"But I'm not used to it," pleaded poor Alice in a piteous tone. And she thought to herself: "I wish the creatures wouldn't be so easily offended."

"You'll get used to it in time," said the Caterpillar; and it put the hookah into its mouth and began smoking again.

This time Alice waited patiently until it chose to speak again. In a minute or two the Caterpillar took the hookah out of its mouth and yawned once or twice, and shook itself. Then it got down off the mushroom, and crawled away into the grass, merely remarking as it went: "One side will make you grow taller, and the other side will make you grow shorter."

"One side of *what?* The other side of *what?*" thought Alice to herself.

"Of the mushroom," said the Caterpillar, just as if she had asked it aloud; and in another moment it was out of sight.

Alice remained looking thoughtfully at the mushroom for a minute, trying to make out which were the two sides of it; and as it was perfectly round, she found this a very difficult question. However, at last she stretched her arms round it as far as they would go, and broke off a bit of the edge with each hand.

"And now which is which?" she said to herself, and nibbled a little of the right-hand bit to try the effect. The next moment she felt a violent blow underneath her chin; it had struck her foot!

She was a good deal frightened by this very sudden change, but she felt that there was no time to be lost, as she was shrinking rapidly; so she set to work at once to eat some of the other bit. Her chin was pressed so closely against her foot that there was hardly room to open her mouth; but she did it at last, and managed to swallow a morsel of the left-hand bit.

The next minute she had grown so tall that her neck rose like a stalk out of a sea of green leaves, and these

green leaves were the trees of the wood. A pigeon attacked her, calling her a serpent, and no wonder, with such a neck. But by nibbling bits of mushroom she at last succeeded in bringing herself down to her usual height. But, oh dear, in order to get into the first house she saw, she had to eat some more of the mushroom from her right hand and bring herself down to nine inches. Outside the house she saw the Fish-footmen and the Frog-footmen with invitations from the Queen to the Duchess, asking her to play croquet. The Duchess lived in the house, and a terrible noise was going on inside, and when the door was opened a plate came crashing out. But Alice got in at last, and found a strange state of things. The Duchess and her cook were quarreling because there was too much pepper in the soup. The cook threw everything she could lay hands on at the Duchess, and nearly knocked the baby's nose off with a saucepan.

The Duchess had the baby in her lap, and tossed it about ridiculously, finally throwing it in the most heartless way to Alice, and telling her she could nurse it if she liked. She took it out of doors, and, behold, it turned into a little pig, jumped out of her arms and ran away into the wood.

"If it had grown up," she said, "it would have made a dreadfully ugly child; but it makes rather a handsome pig, I think."

She was a little startled now by seeing the Cheshire Cat—which she had first seen in the house of the Duchess—sitting on a bough of a tree a few yards off. The

THE LAZY BLUE CATERPILLAR TELLING ALICE ABOUT THE MUSHROOM



In a minute or two the Caterpillar took the hookah out of its mouth, yawned once or twice, and shook itself. As it got down off the mushroom, it remarked: "One side will make you grow taller, and the other side will make you grow shorter." "One side of *what?* The other side of *what?*" thought Alice. "Of the mushroom," said the Caterpillar, just as if she had asked it aloud. But how was she to tell one side from the other?

Cat only grinned when it saw Alice. It looked good-natured, she thought; still, it had *very* long claws and a great many teeth, so she felt that it ought to be treated with respect.

"Cheshire Puss," she began rather timidly, as she did not at all know whether it would like the name; however, it only grinned a little wider. "Come, it's pleased so far," thought Alice, and she went on: "Would you tell me, please, which way I ought to walk from here?"

"That depends a good deal on where you want to get to," said the Cat.

"I don't much care where——" said Alice.

"Then it doesn't matter which way you walk," said the Cat.

"So long as I get *somewhere*," Alice added as an explanation.

"Oh, you're sure to do that," said the Cat, "if you only walk long enough!"

Alice felt that this could not be denied, so she tried another question.

"What sort of people live about here?"

"In *that* direction," the Cat said, waving its right paw round, "lives a hatter; and in *that* direction"—waving the other paw—"lives a March hare. Visit either you like; they're both mad."

"But I don't want to go among mad people," Alice remarked.

"Oh, you can't help that," said the Cat; "we're all mad here! I'm mad. You're mad."

"How do you know I'm mad?" said Alice.

"You must be," said the Cat, "or you wouldn't have come here."

Alice didn't think that proved it at all; however, she went on: "And how do you know that you're mad?"

"To begin with," said the Cat, "a dog's not mad. You grant that?"

"I suppose so," said Alice.

"Well, then," the Cat went on, "you see, a dog growls when it's angry, and wags its tail when it's pleased. Now, *I* growl when I'm pleased, and wag my tail when I'm angry. Therefore I'm mad."

"*I* call it purring, not growling," said Alice.

"Call it what you like," said the Cat. "Do you play croquet with the Queen to-day?"

"I should like it very much," said Alice, "but I haven't been invited yet."



"Cheshire Puss," Alice began rather timidly, "would you tell me, please, which way I ought to walk from here?" "That depends on where you want to get to," said the Cat, which was grinning strangely.

"You'll see me there," said the Cat, and vanished. . . . Alice waited a little, half expecting to see it again, but it did not appear, and after a minute or two she walked on in the direction in which the March Hare was said to live.

"I've seen hatters before," she said to herself; "the March Hare will be much the more interesting, and perhaps as this is May it won't be raving mad—at least, not so mad as it was in March." As she said this, she looked up, and there was the Cat again, sitting on a branch of a tree.

"Did you say pig, or fig?" said the Cat.

"I said pig," replied Alice; "and I wish you wouldn't keep appearing and vanishing so suddenly; you make one quite giddy."

"All right," said the Cat; and this time it vanished quite slowly, beginning with the end of the tail, and ending with the grin, which remained some time after the rest of it had gone.

"Well, I've often seen a cat without a grin," thought Alice; "but a grin without a cat! It's the most curious thing I ever saw in all my life."

She had not gone much farther before she came in sight of the house of the March Hare; she thought it must be the right house, because the chimneys were shaped like ears and the roof was thatched with fur. It was so large a house that she did not like to go nearer till she had nibbled some more of the left-hand bit of mushroom, and raised herself to about two feet high; even then she walked up towards it rather timidly, saying to herself: "Suppose it should be raving mad after all. I almost wish I'd gone to see the Hatter instead."

There was a table set out under a tree in front of the house, and the March Hare and the Hatter were having tea at it; a dormouse was sitting between them fast asleep, and the other two were using it as a cushion, resting their elbows on it, and talking over its head.

"Very uncomfortable for the Dormouse," thought Alice; "only, as it's asleep, I suppose it doesn't mind."

The table was a large one, but the three were all crowded together at one corner of it.

"No room! No room!" they cried out when they saw Alice coming.

"There's *plenty* of room!" said Alice indignantly. And she sat down in a large armchair at one end of the table.

"Have some wine," the March Hare said, in an encouraging tone.

Alice looked all round the table, but there was nothing on it but tea.

"I don't see any wine," she remarked.

"There isn't any," said the March Hare.

"Then it wasn't very civil of you to offer it," said Alice angrily.

"It wasn't very civil of you to sit down without being invited," said the March Hare.

"I didn't know it was *your* table," said Alice; "it's laid for a great many more than three."

"Your hair wants cutting," said the Hatter.

He had been looking at Alice for some time with great curiosity, and this was his first speech.

"You should learn not to make personal remarks," Alice said, with some severity; "it's very rude."

The Hatter opened his eyes very wide on hearing this, but all he *said* was:

"Why is a raven like a writing-desk?"

"Come, we shall have some fun now," thought Alice. "I'm glad they've begun asking riddles. I believe I can guess that," she added aloud.

"Do you mean that you think you can find out the answer to it?" said the March Hare.

"Exactly so," said Alice.

"Then you should say what you mean," the March Hare went on.

"I do," Alice hastily replied; "at least—at least, I mean what I say. That's the same thing, you know."

"Not the same thing a bit," said the Hatter. "Why, you might just as well say that 'I see what I eat' is the same thing as 'I eat what I see.'"

"You might just as well say," added the March Hare, "that 'I like what I get' is the same thing as 'I get what I like.'"

"You might just as well say," added the Dormouse, who seemed to be talking in his sleep, "that 'I breathe when I sleep' is the same thing as 'I sleep when I breathe.'"

"It *is* the same thing with you," said the Hatter; and here the conversation dropped, and the party sat silent for a minute, while Alice thought over all she could remember about ravens and writing-desks, which wasn't much.

The Hatter was the first to break the silence.

"What day of the month is it?" he said, turning to Alice.

He had taken his watch out of his pocket and was looking at it uneasily, shaking it every now and then, and holding it to his ear.

Alice considered a little, and said:

"The fourth."

"Two days wrong," sighed the Hatter. "I told you butter wouldn't suit the works," he added, looking angrily at the March Hare.

"It was the *best* butter," the March Hare meekly replied.

"Yes, but some crumbs must have got in as well," the Hatter grumbled. "You shouldn't have put it in with the bread-knife."

The March Hare took the watch and looked at it gloomily; then he dipped it into his cup of tea, and looked at it again, but he could think of nothing better to say than his first remark: "It was the *best* butter, you know."

Alice had been looking over his shoulder with some curiosity.

"What a funny watch!" she remarked. "It tells the day of the month, and doesn't tell what o'clock it is."

"Why should it?" muttered the Hatter. "Does your watch tell you what year it is?"

"Of course not," Alice replied very readily; "but that's because it stays the same year for such a long time together."

"Which is just the case with *mine*," said the Hatter.

Alice felt dreadfully puzzled. The Hatter's remark seemed to her to have no sort of meaning in it, and yet it was certainly English.

"I don't quite understand you," she said, as politely as she could.

"The Dormouse is asleep again," said the Hatter; and he poured a little hot tea on to its nose.

The Dormouse shook its head impatiently, and said, without opening its eyes:

"Of course, of course. Just what I was going to remark myself."

"Have you guessed the riddle yet?" the Hatter said.

"No, I give it up," Alice replied. "What's the answer?"

"I haven't the slightest idea," said the Hatter.

"Nor I," said the March Hare.

Alice sighed wearily.

"I think you might do something better with the time," she said, "than wasting it in asking riddles that have no answers."

"If you knew Time as well as I do," said the Hatter, "you wouldn't talk about wasting *it*. It's *him*."

"I don't know what you mean," said Alice.

"Of course you don't," the Hatter said, tossing his head contemptuously. "I dare say you never even spoke to Time."

"Perhaps not," Alice cautiously replied; "but I know I have to beat time when I learn music."

"Ah, that accounts for it!" said the Hatter. "He won't stand beating. Now, if you only kept on good terms with him, he'd do almost anything you liked with the clock. For instance, suppose it were nine o'clock in the morning, just time to begin lessons: you'd only have to whisper a hint to Time, and round goes the clock in a twinkling. Half-past one, time for dinner!"

"I only wish it was," the March Hare said to himself in a whisper.



The March Hare took the watch and looked at it gloomily; then he dipped it into his tea, and looked at it again, but could think of nothing better to say than his first remark: "It was the *best* butter, you know."

"That would be grand, certainly," said Alice thoughtfully; "but, then—I shouldn't be hungry for it, you know."

"Not at first, perhaps," said the Hatter; "but you could keep it to half-past one as long as you liked."

"Is that the way *you* manage?" Alice asked.

The Hatter shook his head mournfully. "Not I!" he replied. "We quarreled last March—just before *he* went mad, you know" (pointing with his teaspoon at the March Hare). "It

was at the great concert given by the Queen of Hearts, and I had to sing:

'Twinkle, twinkle, little bat!
How I wonder what you're at!'

You know the song, perhaps?"

"I've heard something like it," said Alice.

"It goes on, you know," the Hatter continued, "in this way:

'Up above the world you fly,
Like a tea-tray in the sky.
Twinkle, twinkle—'"

Here the Dormouse shook itself, and began singing in its sleep: "*Twinkle, twinkle, twinkle, twinkle*——" and went on so long that they had to pinch it to make it stop.

"Well, I'd hardly finished the first verse," said the Hatter, "when the Queen bawled out, 'He's murdering the time! Off with his head!'"

"How dreadfully savage!" exclaimed Alice.

"And ever since that," the Hatter went on in a mournful tone, "he won't do a thing I ask. It's always six o'clock now."

A bright idea came into Alice's head. "Is that the reason so many tea-things are put out here?" she asked.

"Yes, that's it," said the Hatter with a sigh; "it's always tea-time, and we've no time to wash the things between whiles."

"Then you keep moving round, I suppose?" said Alice.

"Exactly so," said the Hatter; "as the things get used up."

"But when you come to the beginning again?" Alice ventured to ask.

"Suppose we change the subject," the March Hare interrupted, yawning. "I'm getting tired of this. I vote the young lady tells us a story."

"I'm afraid I don't know one," said Alice, rather alarmed at the proposal.

"Then the Dormouse shall!" they both cried. "Wake up, Dormouse!" And they pinched it on both sides at once.

The Dormouse slowly opened its eyes. "I wasn't asleep," it said, in a hoarse, feeble voice. "I heard every word you fellows were saying."

"Tell us a story," said the March Hare.

"Yes, please do!" pleaded Alice.

"And be quick about it," added the Hatter, "or you'll be asleep again before it's done."

"Once upon a time there were three little sisters," the Dormouse began in a great hurry; "and their names were Elsie, Lacie, and Tillie; and they lived at the bottom of a well——"

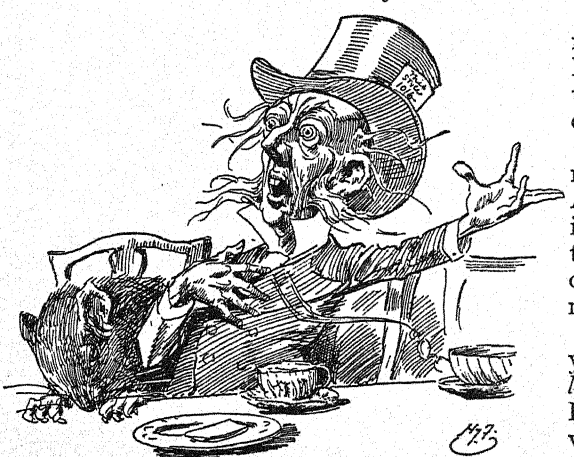
"What did they live on?" said Alice, who always took a great interest in questions of eating and drinking.

"They lived on treacle," said the Dormouse, after thinking a minute or two.

"They couldn't have done that, you know," Alice gently remarked; "they'd have been ill."

"So they were," said the Dormouse; "*very* ill."

Alice tried a little to fancy to herself what such an extraordinary way of living would be like, but it puzzled her too much, so she went on: "But why did they live at the bottom of a well?"



The Mad Hatter singing "Twinkle, twinkle, little bat!"

"Take some more tea," the March Hare said to Alice very earnestly.

"I've had nothing yet," Alice replied in an offended tone, "so I can't take more."

"You mean you can't take *less*," said the Hatter. "It's very easy to take *more* than nothing."

"Nobody asked *your* opinion," said Alice.

"Who's making personal remarks now?" the Hatter asked triumphantly.

Alice did not quite know what to say to this, so she helped herself to some

THE DORMOUSE FALLS ASLEEP TELLING ITS STORY



The Dormouse had closed its eyes while telling its very absurd story, and was going off into a doze; but, on being pinched by the Hatter, it woke up again, and continued its tale, though it never got to the end of it.

tea and bread and butter, and then turned to the Dormouse and repeated her question: "Why did they live at the bottom of a well?"

The Dormouse again took a minute or two to think about it, and then said: "It was a treacle-well."

"There's no such thing," Alice was beginning very angrily, but the Hatter and the March Hare went "Sh! sh!" and the Dormouse sulkily remarked: "If you can't be civil, you'd better finish the story for yourself."

"No, please go on," Alice said very humbly; "I won't interrupt you again. I dare say there may be *one*."

"One, indeed!" said the Dormouse indignantly. However, it consented to go on. "And so these three little sisters—they were learning to draw, you know——"

"What did they draw?" said Alice, quite forgetting her promise.

"Treacle," said the Dormouse, without considering at all this time.

"I want a clean cup," interrupted the Hatter. "Let's all move one place on." He moved on as he spoke, and the Dormouse followed him; the March Hare moved into the Dormouse's place, and Alice rather unwillingly took the place of the March Hare.

The Hatter was the only one who got any advantage from the change, and Alice was a good deal worse off than before, as the March Hare had just upset the milk-jug into his plate. Alice did not wish to offend the Dormouse again, so she began very cautiously: "But I don't understand. Where did they draw the treacle from?"

"You can draw water out of a water-well," said the Hatter; "so I should think you could draw treacle out of a treacle-well—eh, stupid?"

"But they were *in* the well," Alice said to the Dormouse, not choosing to notice this last remark.

"Of course they were," said the Dormouse—"well in."

This answer so confused poor Alice

that she let the Dormouse go on for some time without interrupting it.

"They were learning to draw," the Dormouse went on, yawning and rubbing its eyes, for it was getting very sleepy; "and they drew all manner of things—everything that begins with an M——"

"Why with an M?" said Alice.

"Why not?" said the March Hare.

Alice was silent.

The Dormouse had closed its eyes by this time, and was going off into a doze; but, on being pinched by the Hatter, it woke up again with a little shriek, and went on: "——that begins with an M, such as mouse-traps, and the moon, and memory, and muchness—you know you say things are 'much of a muchness'—did you ever see such a thing as a drawing of a muchness?"

"Really, now you ask me," said Alice, confused, "I don't think——"

"Then you shouldn't talk," said the Hatter.

This piece of rudeness was more than Alice could bear; she got up in disgust, and walked off. The Dormouse fell asleep instantly, and neither of the others took the least notice of her going, though she looked back once or twice, half hoping that they would call after her.

The last time she saw them, they were trying to put the Dormouse into the teapot.

"At any rate, I'll never go *there* again," said Alice, as she picked her way through the wood. "It's the stupidest tea-party I ever was at in all my life."

. . . . . .

What happened after Alice got away from the Mad Tea-Party, and the other adventures that befell her before the end of her story, are told on page 3157.

THE FABLES OF ÆSOP THE SLAVE

THE OLD MAN AND HIS SONS

AN old man had three sons, who were always quarreling with one another. The father often tried to reconcile them, and told them how foolish it was to quarrel; but his advice had no effect upon them.

So one day he called his three sons and gave them a bundle of firewood, telling them each to try if with all their might and strength they could break the bundle of sticks into two pieces. Each one tried without success, for the sticks were so closely and tightly bound together that no man's strength was sufficient to break them.

Then the father untied the bundle, and told his sons to break the sticks one by one, which they were able to do quite easily. Then he said to them:

"My boys, you see how important it is to keep together. When you are united in the bonds of friendship, no one can hurt you; but if you quarrel and separate, people will be able to injure you."

Union is strength.

THE CRAB AND HER MOTHER

EVERYONE who has been to the sea-side, and has watched the little crabs in the rock pools, will have noticed that they generally walk sideways. It is said that once upon a time a mother crab scolded her daughter for walking sideways, pointing out that it looked very awkward, and was quite unlike the way the rest of the world walked.

"Indeed, mother," replied the young crab, "I walk as well as ever I can; but if you would like me to do it in a different way, I wish you would set me an example, and show me the proper way to walk, because I have always noticed that you walk sideways yourself."

Example is better than precept.

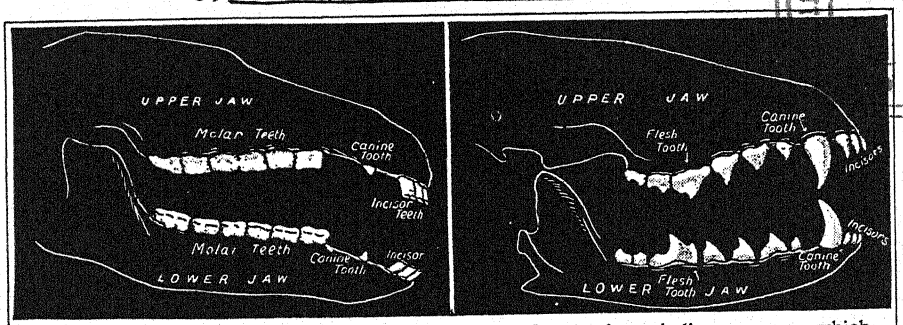
THE TORTOISE AND THE EAGLE

A TORTOISE, who had grown tired of crawling about on the ground, and wanted to see the world, published a notice that if any bird would take him up into the air and show him the world, he would reward him by giving to him a number of precious stones which he knew were hidden in a certain place in the ground.

The eagle undertook to do as he wished, and carried the tortoise high up in the air to look round. Then he asked him to tell him where the precious stones were hidden, but the tortoise, who had never seen any precious stones, of course could not keep his promise, so the eagle dropped him, and he was dashed to pieces on the rocks far below.

People who do not keep their promises are sure to suffer for it sooner or later.

THE NEXT STORIES BEGIN ON PAGE 3157.



On the left are shown the teeth of the horse, with a flat top for grinding grass, on which he lives. On the right are shown the teeth of the wolf, with sharp fangs for tearing flesh.

HOW AND WHEN TO EAT

CONTINUED FROM 2951



WE have carefully studied the first and most important of human foods, which is milk. Without milk none of us could grow up to eat anything else, so its place as first of all foods is beyond question. And we have studied the great cereal foods and their value to the whole of mankind. But we know that men eat other food besides milk and bread; we all do so, civilized and savage, if we can get it, and we are better for it.

This is one of the supreme facts about mankind—a fact which helps to explain many of the most striking things in our history and our present lives. The idea is that man should and does make use not of one thing, or two, or three, of all that Nature produces, but of many or all of her products. We can do this because we have been made capable of suiting ourselves to all circumstances, and if we are deprived of one thing we can make another take its place. Now, when a chair, say, can be adapted to become a table, we call it adaptable.

So when a living creature, that usually lives in one climate and on one food, can live in another climate and on another food, we call it adaptable, and say that this is an instance of *adaptation*. All living creatures have some range of adaptation—as, for instance, to the change of temperature produced by night and day; but man is vastly more adaptable than any other living creature—animal or vegetable—and to this wonderful power he owes the fact that, while other creatures can live only in this, or that, part of the world, man can and does live anywhere, and in any circumstances. Now, this very largely means that he can eat a greater variety of foods, and live upon them more successfully, than can any other creature.

This does not mean that cabbages are as good a food as milk, or that there is no real difference between eating meat three times a day and eating no meat at all; but it does mean that when people ask us to believe that we ought to live on bread alone, or on any particular food alone, they are probably wrong.

When we examine the diet of a fish, or a tiger, or a bird, we find that it is very limited. When we visit a zoological garden and ask questions of the keepers, we learn that all the animals there have their particular kind of diet, and will not thrive on any other. We find, too, that the lions and tigers will not eat buns, that the sea-lions will touch nothing but fish, and so on. But *we* eat buns, and sugar, and nuts, and fish, and meat, and many other things. Now, this has a meaning.

It means that man has conquered the earth, largely because he can live, and even thrive, on almost everything that Nature produces. Our organs of digestion, we know, are provided with the power of dealing with almost anything that could possibly be thought of as a food. If we study our teeth from this point of view we learn the same lesson.

THE TEETH OF ALL CREATURES ARE SUITED TO THE FOODS THEY NEED

When we look at the jaws of the horse, or the hippopotamus, or the lion, or the rabbit, we see special kinds of teeth, arranged in special ways, for a particular kind of food. It is this that makes the study of teeth so important, and especially is this so in the case of animal remains that teach us the past life of the earth, for the teeth teach us the habits of these creatures. Now, our own teeth have the great and striking character that they are suited for every kind of food. We all know the word *devour*, and the second half of it means *eat*. So we make up words like carnivorous, herbivorous, and omnivorous, which everyone should understand. *Carni* means flesh, *herbi* means herbs in general, like grass, and *omni*, of course, means all, like omnibus, which means "for all." Now, the teeth of most animals are adapted to either a carnivorous or herbivorous diet, or else to some other special diet, but the teeth of mankind are adapted to an omnivorous diet. So is the structure of our digestive organs. These two facts are enough in themselves to suggest that man is meant to live not by bread alone, but by every kind of good food; and the case is finally proved when we find that another natural fact about us, our appetite, points to the same thing. The sea-lion has no appetite for buns, or sugar, or nuts, or even red meat —only for fish; and the other animals have their special appetites.

THE WONDERFUL WAY IN WHICH WE ADAPT OURSELVES TO ALL KINDS OF FOOD

This puzzles the boy who expects all the animals to like all the things he likes. But the lesson is that not only his teeth and his digestive organs, but his appetite also, are omnivorous, whereas this is not the case with the other creatures. So, where the earth grows only rice, man lives and even thrives; but where it affords little but reindeer and blubber, as in the frozen North, man succeeds in living too, because of his power of adaptation. Now, this great power shows itself in another way. Just as man can live on strange and limited diets if he has to do so, so he can live on them if he chooses to do so. In America we have the choice of eating practically every single thing that the whole earth produces. We grow, or the world sends to us, fruit and flesh, cheese and rice, and everything else. But mankind is so adaptable that, if we choose, as some of us do, to live only on raw meat and hot water, or on nuts and cheese alone, or on milk only, or on bread and a few things like it, we can do so. At first, if we suddenly change our diet, we may suffer, but after a time we adapt ourselves to the new kind of food, and are all right again. Most of us agree that when people make up their minds to live entirely on some special food, it is a "fad"; and it is man's amazing power of adaptation that makes this possible.

THE GREAT IMPORTANCE OF VARIETY IN OUR FOOD

But though the possibility of these fads is deeply interesting, and though the reason why they are possible is more interesting still, yet we have not disposed of the great argument provided by our teeth, our digestive organs, and our natural appetite, that it is best for most of us to live on a *mixed diet*. The conclusion reached by all the great students of this subject is that a mixed diet is best for man, and that the fullest lives and the best work are done, on the average, by those nations and those persons who live on a mixed diet. "Variety is the spice of life," and this applies to variety in food. Further, if we take only one kind of food it is possible that we are taking too much proteid—or too little—in proportion to the other elements, or too much or too little starch or fat, and so we throw a tax on our digestive organs. If we are careful with our appetites, and use them as we should, on a mixed diet it is more likely that we shall get a suitable proportion of the various food-elements.

But men and women and children are not all the same. All our faces and all our voices are different, and these differences suggest deeper differences still, which do exist. We are not all equally adaptable. Some of us like eggs, and thrive on a diet including many

eggs; but there are people to whom even a trace of egg in anything they have eaten is a real poison, and makes them seriously ill. We say, "As full as an egg is of meat," and it is true that an egg is simply crammed with fine food; but we also say truly that "One man's meat is another man's poison."

WHY DIFFERENT KINDS OF PEOPLE NEED DIFFERENT KINDS OF FOOD

So there are people who live best on a special diet, people who are happier and do better work—which means the same thing—when they take no meat, and others who are best when they take little else but meat.

Wise people find these things out for themselves. If they are very wise, they understand that what suits them does not necessarily suit other people. But though we waste a lot of time in foolish discussions about food, there are a great many questions about it which need wise discussion. Few things are more important for the life of man than the question of milk and the question of bread. Also, it is most important to remember that though the body can adapt itself to get what it needs out of a host of different foods, yet it has definite needs, as we have seen, which must be satisfied if it is to live at all.

We must have carbon in our food, but no power of adaptation, no degree of faith, no amount of practice, will enable us to use carbon in the form of diamonds or coal-dust, or to live on the nitrogen which is part of the stuff called laughing-gas. There is no system of diet which contains nothing but beef-tea or clear soup, because these are not foods, and nothing will make them foods. We ought to know these things; and we must also learn what are the foods that are cheap, what are the sham foods, that usually cost a lot of money but are not really foods at all, and what are the foods of which it is risky to eat too much, because they contain some poison—as meat, for instance, certainly does.

THE APPETITE AS A NATURAL GUIDE TO FOOD

First, however, we must understand once and for all that Nature has given us a guide, and that we are bound to take care of it. Animals think nothing about food, and yet they know everything they need to know. They have never heard of proteids, yet they are wise enough to eat what is good for them, and just as much as is good for them, when they need it, and at no other time.

That is the ideal state of things which human beings are far enough from having reached. The secret of the animal is that it has a natural and healthy appetite, that guides it from day to day. If, however, the animal is a domestic one, that lives with human beings, and that, instead of finding its own living in a state of nature, has its food provided for it by us, then we find that it eats when it is not really in need of food, eats things that are not good for it, refuses things that are good for it, and eats more than is good for it of the things that are good for it, just exactly as though it were one of ourselves.

Our difficulty is that most of us—all of us, indeed, in some measure—have changed our appetites by our habits, just as we have changed the appetites of the animals we live with. So our appetites, like theirs, can no longer be trusted.

HOW WE HAVE SPOILED OUR APPETITES BY OUR HABITS

We have all sorts of wrong notions and wrong practices. Many grown-up people think that if a child wants sugar—which *they* do not happen to want—it is greedy, and must be punished. So, of course, when the child can get sugar, of which it has been starved, it eats too much, and makes itself ill, and then we blame it.

The beginning of the trouble was that we did not trust natural appetite, and so have damaged it. Then we cook our food, and, though there are good reasons for doing that, it probably means that instead of trusting to the natural flavor of the food—which is one of the things that appetite judges by—we put in all sorts of unnatural flavors—like mustard, and pepper, and vinegar, and artificial gravies—all of which have the effect of misleading the appetite, and persuading us to eat more than is good for us of good things, or to take things which the natural appetite would not care for at all.

So I am afraid we are quite right when we are inclined not to trust our appetites; but it is we that have made them untrustworthy. I believe that it is the duty of every sensible person to keep his own appetite as natural as possible, and to take great care of the appetites of children, so that they may remain as

worthy of trust as they are at first in all healthy babies and children who have been sensibly fed. Our feelings do not exist to mislead us, but to guide us. How dare we think our bodies so foolishly made that everything they tell us is deceitful? The reason why we suffer is not that we obey our feelings, but that we disobey them and cheat them.

WE SHOULD EAT ONLY WHEN HUNGRY AND DRINK ONLY WHEN THIRSTY

It is not eating when we are hungry that hurts, but tempting ourselves to eat when we are not really hungry, but merely greedy. It is not drinking when we are thirsty that hurts us, but going on drinking when we are no longer thirsty, just because the drink has a nice taste.

There are some more very important things to be said before we need study any particular foods. I am specially trying to put things in their place of right importance. Milk and the cereals are so tremendously important that they had to have special places for themselves, but after them there are no special foods nearly so important as are these general questions of appetite, and of how and when to eat.

First we must learn about cooking. So much of our food is cooked, and cooking takes up so much of our time, that we ought to know what the good of it is. One of our first reasons for cooking certain kinds of food, such as meat, is to change the look of it; we do not like it to look too red and raw. That, however, is not a particularly good reason, and, indeed, meat is not made easier to digest by being cooked. Another reason why we cook food is to soften it, and this especially applies to vegetable food. Another reason for cooking food, this time a good one, is that cooking kills the microbes in it. As regards the boiling, which is really the cooking, of milk, this is very important.

HOW WE CHEAT OUR APPETITE AND EAT MORE THAN IS GOOD FOR US

Then, also, we use cooking to cheat the appetite, and to persuade people to eat more than they really need, and that is the worst of the reasons why we cook our food. Now, the most important thing for us to know is whether cooking in general makes food better for us or worse, easier to digest or less easy. This all depends on the kind of food. A cooked egg takes much longer to digest than a raw one, and the harder it is boiled, the more difficult is it to digest. An uncooked potato, on the other hand, is all but useless to us, for the part of it which our bodies can digest is nearly all covered by tiny little coats of hard, almost woody material, which we cannot digest. Cooking bursts these coats, so that the starch inside can get out, and be used by us. When meat is cooked, the tough fibres that hold it together are loosened and softened, but the food part itself is hardened and made less digestible. If we wish to take meat in the most digestible way, we must take it raw and chop it up or else grate it. Over-cooked or twice-cooked meat is very indigestible; boiled meat is more digestible than roasted.

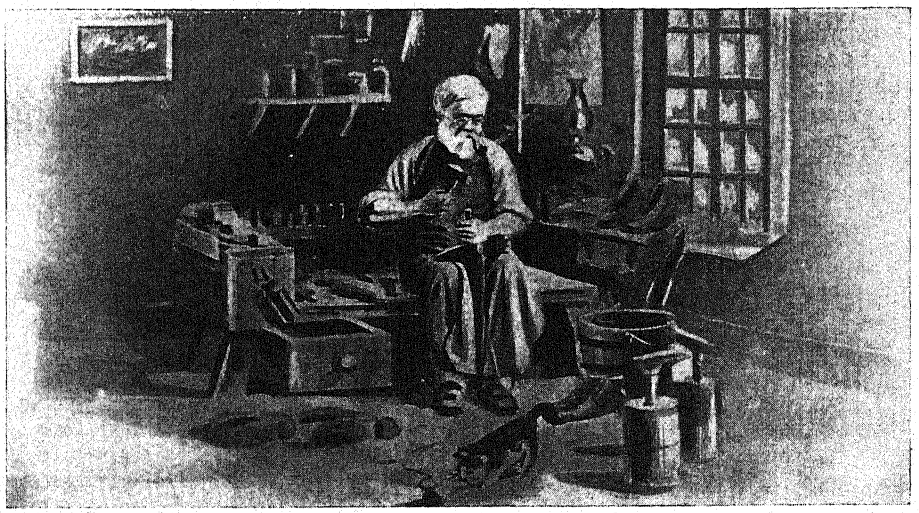
There is yet a great deal to learn about cooking, or, to speak more generally, about the preparation of food for eating. At present we think only of the appearance of the dish and its taste; we think almost nothing of the effects of what we do upon the digestion of the food; and we care nothing for waste.

THE IMPORTANCE OF GOOD COOKING TO A NATION'S HEALTH AND HAPPINESS

As we have seen, we are content to cook green vegetables and throw away the water, which contains valuable salts; and, as a rule, in cooking potatoes, we peel them and soak them, and so waste some of the most valuable of the food materials they contain. When we peel them we cut away the proteid layer just under the skin, and when we soak them a lot of useful matter goes into the water. Potatoes should either be steamed or boiled in their jackets, and the latter is vastly the better way.

So much depends upon good cooking, as regards the welfare of a nation, the health of its people, and their happiness in their homes, and so much harm is done by cooking which is either simply bad or else clever but turned to wrong uses, that the time must certainly come when this important science, and it is a science, will be taught to children of all classes. As long as the lives of men, women, and children depend upon food, the right preparation of food is a subject which is well worthy of anyone's serious study, and a queen is none the worse a queen if she can cook pastry that would not make her people ill.

THE NEXT PART OF THIS IS ON PAGE 3179.



THE OLD COBBLER IN HIS SHOP

THE STORY IN A PAIR OF SHOES

CONTINUED FROM 2847

IF you look at your shoe, you will notice three parts, the upper, sole and heel. You may think the story these parts have to tell is simple and brief, but when we learn that they may have passed through one hundred and sixty different machines and two hundred and nine different pairs of hands, you begin to realize that the making of a pair of shoes is not such a simple matter as it seems. Let us see how it is done.

All the different kinds of shoes worn at the present time have interesting stories of their own. The " peg " shoe could tell how it gets its name from small wooden pins or pegs, which are driven through the soles and uppers to hold them together. The " standard screw " shoe, which is very strong and heavy, might relate how its sole is attached to the upper by a threaded brass wire, which is screwed in. The " McKay sewed shoe " might tell how it took its name from Gordon McKay, through whose interest the McKay Sewing Machine was perfected. The " turn " shoe, which is very light, could tell a longer story, for, though it is now worn by only a few people, it was invented centuries ago. But more important than any of these is the Goodyear Welt shoe, which is worn by a great many people and is now considered the best machine-made footwear. We shall show you how it is made.

HOW HAND-MADE SHOES ARE MADE

Many people still have their shoes made by hand, because they believe hand-made shoes are superior to those made by machinery. Most hand-made shoes command a very high price, because of the fine material used and excellent workmanship. As it is, most hand-made shoes have the outsole stitched to the welt by a machine.

In the early days all the shoes were made by hand. The chief tools used were the hammer, lapstone, the needle, knife and awl. In any shoe-repairing shop you may still see the shoemaker working with these tools, which have not changed very much for a hundred years and more. But within the last seventy years, machines have been invented for every important process in the manufacture of shoes, and large factories have been established where millions and millions of pairs of them are made every year.

Copyright, 1915, 1918, by M. Perry Mills.

NEW ENGLAND THE CENTRE OF SHOE-MANUFACTURING IN AMERICA

The first shoemaking recorded in America was by Thomas Baird, or Beard, who arrived in 1629 on the second voyage of the Mayflower. He was engaged by the Plymouth Company to make shoes for the colonists. For this purpose he brought with him different kinds of hides and the various tools. It is recorded that a planter in Virginia in 1636 employed six shoemakers to make shoes for his slaves.

The making of shoes became such an important industry in the early history of the country, that laws were passed regulating it. In Pennsylvania, in 1721, severe laws were passed regarding the making of shoes and fixing the price to be paid for them. Men were compelled to use good leather and to sell at a fair price. Laws fixing prices were once common, but until recently we have had few of them for many years.

Early in the history of New England, Lynn, Massachusetts, became a shoemaking centre. Philip Kertland, an experienced Welsh shoemaker, came there only a few years after Baird reached Plymouth, and taught his art to many of the colonists in the vicinity. In a few years Lynn was making many of the shoes then sold in Boston. John Adam Dagyr, another celebrated shoemaker, also settled there in 1750. He secured the best samples of work from abroad and taught many apprentices. The fame of New England shoes, now known all over the world, is largely due to the training given by these men.

HOW A YOUNG MAN LEARNED THE TRADE

Before the introduction of shoemaking machinery, the young man who wanted to learn the trade was apprenticed for a term of seven years. He was instructed in every part of the trade, and, when he had served his time, he became a full-fledged shoemaker and started out for himself. He was called a journeyman, because he journeyed from place to place in search of work. A family needing shoes would engage him to come into their home to make shoes out of their home-tanned leather, and he would remain with them, working until he had made a year's supply of footwear for customers in this way. This was called "whipping the cat."

A SORT OF FACTORY SYSTEM IS INTRODUCED

A master workman soon realized that he could increase his income greatly by employing other men to do certain portions of the work while he directed their efforts. He could get materials cheaper by buying in large quantities. This gradually led to a division of labor, and was the beginning of the factory system, which has steadily developed since that time.

In 1795 there were in Lynn, Massachusetts, more than two hundred workmen, employing over six hundred journeymen, or shoemakers who had learned the trade, and they manufactured shoes at the rate of about one pair a day per man. This work was often done in little shops, usually located in back yards, where from three to eight men worked together. Factory buildings such as we have to-day were practically unknown at that time.

Some of the work was often given out to women, who sewed together the different parts of the uppers of the shoes by hand in their homes. Lucy Larcom has given us a vivid picture of one of these workers in "Hannah Binding Shoes," from which the following verse is taken:

"Poor lone Hannah,
Sitting at the window, binding shoes!
Faded, wrinkled,
Sitting, stitching in a mournful muse!
Bright-eyed beauty once was she,
When the bloom was on the tree.
Spring and Winter
Hannah's at the window, binding shoes."

John Greenleaf Whittier, the Quaker poet of New England, was a shoemaker in his youth. He praised the gentle craft in a "Ballad to Shoemakers," and also wrote "Cobbler Keezar's Vision."

SOME SHOE MACHINERY IS INVENTED

Previous to 1845 there had been little change in the tools used, the lapstone, the hammer, the crude knife and the awl being the most important. But in that year, a rolling machine was perfected, which took the place of the lapstone and hammer, which the shoemakers had used to make the leather tougher. By the use of this machine, a man could, in half an hour, obtain the same results as a workman could in a whole day, by the old method of pounding.

The first McKay Sewing Machine was

established in Lynn in 1861. At that time there was a great demand for boots for soldiers engaged in the war. As the war also took many men from the shoemaking trade, more and more machinery was used. This increased demand for shoes, and scarcity of labor led to many improvements in shoemaking machinery, the most important of which was the Goodyear Welt Sewing Machine, for which patents were obtained in 1871 and 1875. These patents were the beginning of the now famous Goodyear welt system of manufacturing shoes, but not until nearly twenty years later did the machine become really successful. Since that time one improvement has followed another, until it seems as if they had now reached perfection.

Many factories were built, chiefly at Brockton, Boston, Beverly, Haverhill, and Lynn, and were equipped with all the modern machinery. The industry steadily grew, until in 1912, Massachusetts alone manufactured forty-seven per cent. of all the shoes made in the United States. Missouri is the next state, but the value of its manufactures is only about one-fifth as much as that of Massachusetts. The shoe industry has become one of the largest manufacturing industries in the country, and more than 1,000,000 pairs of boots and shoes are made daily. The American shoe is exported to all parts of the world, and generally recognized as the best. Now let us see how shoes are made in one of the great factories.

THE UPPER, THE SOLES, THE HEELS AND THE LAST

When an order is received at the factory, very careful specifications are made of the shoe ordered, telling its size and style and the quality of the material to be used. Similar descriptions, or specifications, of each part are sent to the foreman who has charge of the making of that part. From careful measurements of these parts, the patterns of the soles and parts of the uppers and linings are cut out, and the lasts are also made. The last, which is made of wood, is the size and shape of the foot for which the shoe is made. In a great factory many shoes are made from the same pattern and on the one last.

The parts of the upper are cut out of leather which is tough but soft and pliable. The machine which does this work cuts more quickly and accurately than any human hand. The edges of these parts are "skived" or thinned down to a beveled edge, then given a coating of cement, and afterwards folded on a machine, which turns back the edge and pounds it down flat, so that it presents a smooth and finished appearance. The toe-caps are stamped out and perforated by a machine. On one of the top linings is stamped the order number and size of the shoe. Then the parts of the upper are sewed together, and the lining is put in. A machine rapidly puts in the eyelets, placing them on both sides at once, directly opposite each other. This finishes the upper.

THE SOLES AND HEELS ON WHICH WE STAND

The outsole, or outer sole, is cut from sole-leather, which is thicker and stronger than that used for the upper. It is then passed to a heavy rolling machine, where it is subjected to tons of pressure between heavy rolls. This pressure, which takes the place of the hammering which the old-time shoemaker gave his leather, brings the fibres more closely together, and greatly increases the wearing qualities. The outsole is then passed through a machine, which reduces it to a uniform thickness.

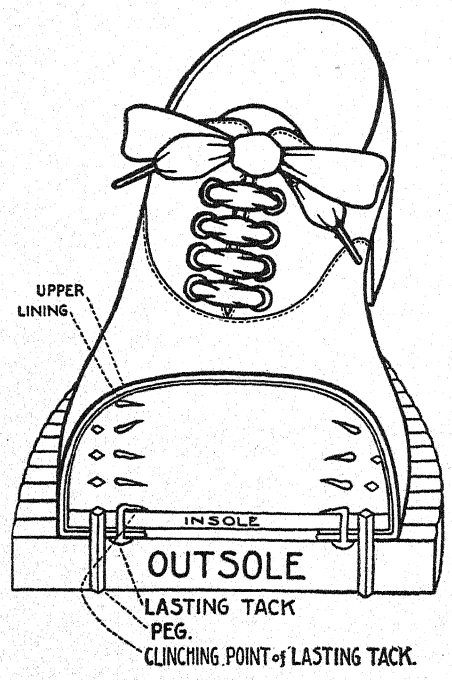
The insole, which is made of much lighter leather, is prepared in a similar manner, and is also reduced to a uniform thickness. A machine cuts a slit which extends half an inch into the edge of the insole, separating the edge into two parts. One of the edges is called the lip. The same machine cuts a small channel or groove along the surface inside the lip. The lip is now turned up by another machine, so that it stands at right angles to the insole. To this lip the welt and upper are sewed later on, and the groove made by the channeling machine inside the lip then serves as a guide for the operator of the sewing machine.

The heel is made of different lifts or layers of leather, cemented together. It is then placed under great pressure, which gives it form and makes it stronger. The counter, which stiffens the back part of the shoe, and the toe-box or stiffening, which is placed between the toe-cap and vamp, are made in the same room. When these are all completed, they are sent to the making or bottoming room, where the other parts have been brought.

PUTTING THE PARTS OF THE SHOE TOGETHER

There a machine passes strong twine through the eyelets and ties it automatically. This keeps all the parts of the upper in their proper position while the shoe is being made. Another machine tacks the insole to the bottom of the last. A workman then places the toe-box and counter in their proper places, and draws the upper over the last.

A wonderful machine pulls the upper smoothly down to the last. The pincers of this machine grasp the leather at different points on each side of the toe. The operator, standing where he can see when the upper is placed exactly where it belongs, presses a foot-lever, the pincers close and draw the leather securely against the wood of the last. By moving different levers the workman adjusts the shoe accurately, so that each part of it lies in the exact position intended for it when the shoe was designed. The operator again presses a foot-lever, the pincers move toward each other and draw the leather securely around the last. At the same time three tacks are driven automatically on each side and one at the toe, which hold the upper securely in position. These tacks are driven in only part way, so that they may afterwards be removed.



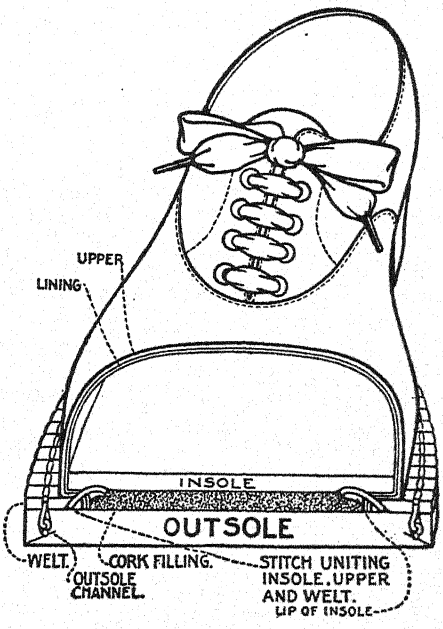
CROSS SECTION OF A PEGGED SHOE

In this type of shoe wooden pegs are driven through the outsole, the upper and the insole. The tacks used in lasting are driven way in and clinched against the steel bottom of the last to help hold the upper and insole together. The ends of the pegs and tacks, which show on the inside, leave the surface rough, until the pegs are cut off.

THE PROCESS OF LASTING, WHICH DRAWS THE LEATHER SMOOTH

The shoe is now ready for lasting. This is one of the most difficult and most important parts of the process, for upon the success of this operation largely depends the beauty and comfort of the shoe. Machines draw the leather tightly around the last, so that not a wrinkle is left anywhere, and also pull it down over the insole, where tacks hold it in place. These tacks are also driven in only part way, so that afterwards they may be removed and leave the inside of the shoe perfectly smooth.

The surplus leather around the insole is cut away and the edges made smooth. The leather and the counter around the heel are then pounded until the stiff



CROSS SECTION OF A WELT SHOE

In this type of shoe the tacks used in lasting are all withdrawn and a machine with a curved needle sews the welt and shoe upper to the insole without going inside the shoe. The outsole is then stitched to the welt. By this method the inside is left perfectly smooth for the foot. Such a shoe does not wear out stockings as a peg shoe does.

portion conforms exactly to the shape of the last.

SEWING THE WELT TO THE INSOLE

The shoe is now ready to receive the welt, which is a narrow strip of leather that is sewed all along the edge of the shoe, except where the heel is placed. This welt is sewed from inside the lip of the insole, so that the curved needle passes through the lip, upper and welt, uniting all three securely and allowing the welt to protrude evenly along the edge. In making the stitch the needle does not go inside the shoe, but passes through only a portion of the insole, leaving the inside perfectly smooth. This part of the work was formerly one of the most difficult tasks in shoemaking. As it was done by hand, different operators sometimes made stitches of different lengths and different tensions. Such stitching did not always wear well, because it did not hold the different parts of the shoe firmly together.

The invention of the Goodyear Welt Sewing Machine changed all this. Auguste Destouy had invented a curved needle machine for sewing outsoles to welts, but it was not successful until taken in hand by Charles Goodyear, son of the well-known inventor of India rubber fabrics. This device was first used in a machine for sewing "turn" shoes, but later was adapted by Mr. Goodyear in the famous sewing machine which bears his name. This machine has revolutionized the manufacture of shoes. It makes stitches of equal length, and measures them automatically, it draws the strong linen waxed thread evenly, and forms a stitch which holds the welt, upper and insole securely together.

After the sewing, the surplus portions of the lip, upper and welt are trimmed off, and the welt is beaten so that it stands out evenly from the side of the shoe.

HOW THE OUTSOLE IS TREATED BEFORE IT IS FASTENED

The insole and welt now receive a coating of rubber cement. The rubber makes the sole water-proof. A workman tacks the shank on the insole between the heel and forepart of the sole and fills the bottom with ground cork and rubber cement. The outside sole receives a coating of this cement on the flesh side, that is, the side next the animal. It is then pressed firmly on the bottom of the shoe, where it is held in place by the cement.

The whole shoe is now forced down into a rubber pad or mold, which has been shaped to the exact curve of the bottom of the shoe. By this process every part of the sole is pressed firmly against the bottom of the shoe and welt, and shaped to the desired curve. The outsole and welt are trimmed so that they protrude a uniform distance from the edge of the shoe.

The outsole is then sewed to the welt by a machine which makes a lockstitch, which shows on the upper side of the welt after the shoe is finished. An automatic leveling machine rolls out any unevenness in the sole.

PLACING AND TRIMMING THE HEEL ONE OF THE LAST THINGS

The heel is now put on, the rough lifts are trimmed to the desired shape, and the breast of the heel is cut to the correct angle and curve. Then the edge of the insole is trimmed smoothly.

The edges of the shoe and welt now receive a coating of special blacking, and every stitch on the upper side of the welt is made to show clearly. The heel is coated with a special ink, and brushed until its surface is bright. The bottom is blacked or stained and also brushed until it has a high gloss. The trade-mark, or trade-name of the manufacturer, is then stamped on the bottom or shank.

The finished shoe is now taken off the last and put on a shoe-tree. Every wrinkle is rubbed out, and three little creases are made across the vamp where it naturally creases when the shoe is bent. After a final brushing, the finished shoe is packed in a pasteboard box, ready for the wearer.

LEATHERS OF SEVERAL KINDS USED FOR SHOES

There are, as you have learned, many kinds of leather made from the skins of different animals. More shoes are made from the skin of the calf than from any other animal. Heels and soles are made from the skin of the ox or cow, and some heavy uppers also. Much kid or goat skin is also used, and some shoes are made from the skin of the horse. Sheepskin is used to imitate kid, and some deerskin is used, but the supply is too small to be of much value.

Other leathers are occasionally used. A few shoes are made from monkey skins, and the skins of alligators and lizards are sometimes used. Very rarely shoes are made from snake skins. Many shoes are also made wholly or partly from cloth, except the sole, of course. This is generally made from leather, except for house shoes, though there are now some substitutes for leather soles, which are much worn.

THE SIZES AND THE NUMBERS OF SHOES

Shoes are made in twenty-six different lengths, numbered in two series from one to thirteen. One-third of an inch is a size, that is, the difference in length between a number eight and a number nine shoe is one-third of an inch. Between most of the sizes, half sizes are made. Usually there are five different widths for each size, A, B, C, D, and E, and in fine shoes there are also half sizes. One-twelfth of an inch is a width, as for example, the difference between a B and C width is one-twelfth of an inch.

Some people are foolish about the size of their feet, and do not like to seem to wear a large shoe. Some manufacturers do not use the regular numbers, but use a special set so that the buyer cannot tell what is the regular number of the shoe he or she is buying. The merchant can often persuade the buyer to get the right size rather than one too small.

SHOES OF OTHER PEOPLES AND OF OTHER TIMES—THE SANDAL

From the earliest times men wore some form of foot-covering to protect their feet from the rough way or hot sands over which they had to travel in search of food and clothing. If the way were not too rough they went about barefoot, as the bottom of the foot will grow hard and horny if it is not protected.

The first foot-covering used was probably a simple form of sandal—a rough piece of hide, wood, or plaited grass, held to the foot by narrow strips of hide, brought up between the toes and tied about the ankle. Rough wooden shoes are still used in some parts of Europe.

Later the sandal was developed and ornamented by the Greeks and Romans. Although this was their usual form of footwear, high boots were used for hunting and traveling. A man's rank was shown by the color of his shoes, in Rome at one time.

Sandals are still worn wherever people remain in a primitive or semi-primitive state. They are also worn by a few orders of friars and by some peasants in Spain, Siberia and the Balkans. The Japanese wear a sandal with a felt sole, and remove it when they enter the house. Although the American shoe is recognized by the government as the official one, the people still cling to the sandal. The upper part or covering is made of many different fabrics.

In cold climates, where more protection was necessary, more straps or thongs were used, but more often a bag-like covering was worn, like the Indian moccasin. The Eskimo wears a high boot, which is very loose at the top. It is made of the skins of animals, and is often lined with feathers.

HIGH SHOES OR BOOTS IN THE PAST

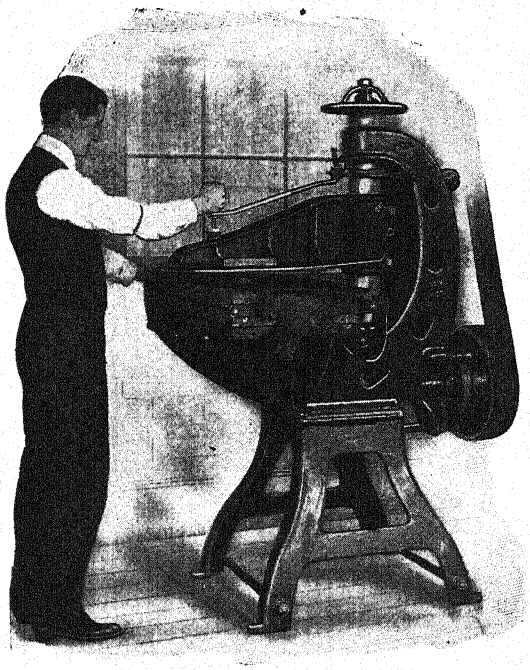
From the sandal, a foot-covering was devised which covered not only the foot, but also the lower part of the leg. Often the leg was made of soft colored leather. One form of heavy boot, which reached above the knee, was called the Jack-boot, still worn occasionally by cavalrymen. Rubber boots of the same shape are now sometimes worn by fishermen and firemen.

After the fourteenth century, shoes began to change their shape. Very long pointed toes became the fashion. The toes were so long that they were tied to the leg about the knees. The style ran to such extremes that laws had to be passed to stop it. In Queen Elizabeth's time very high heels were the fashion. One pair of her slippers which has been preserved had heels nearly four inches high, and very thick soles. Afterward the style called for broad, square toes and low heels. During all this time shoes were much ornamented. Often they had rosettes of silk or gold lace, and were sometimes trimmed with rows of gold braid. Then high heels came in again.

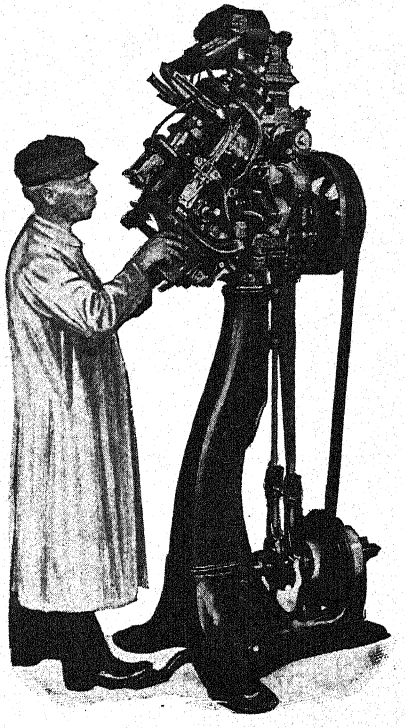
So you see there has never been a standard shoe which was worn at all times. Styles have changed many times, and we may go back some day to the ornamented shoes of four or five hundred years ago. We see house shoes that are much ornamented, and some street shoes are made of colored leathers even now.

THE NEXT STORY OF FAMILIAR THINGS IS ON PAGE 3407.

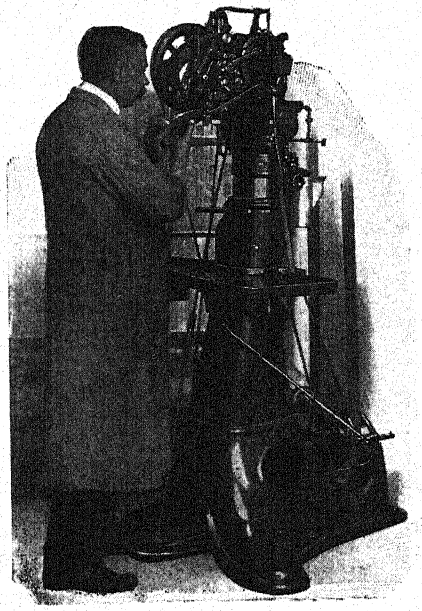
SOME MACHINES USED IN MAKING SHOES



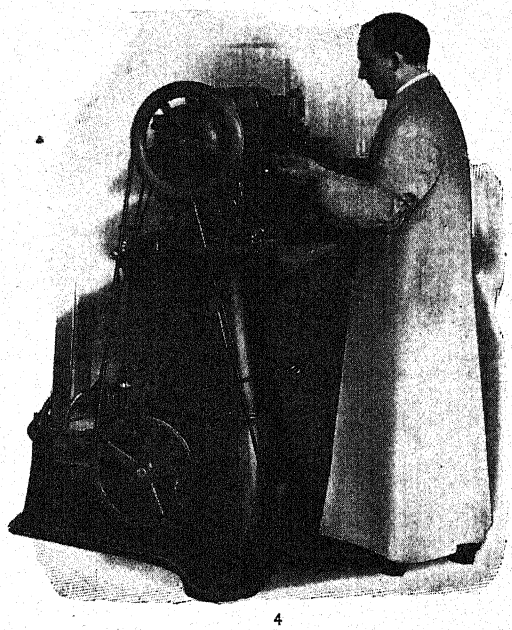
1



2

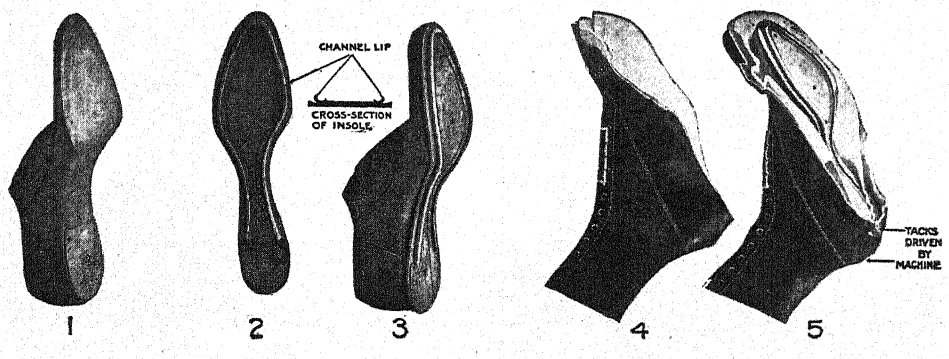


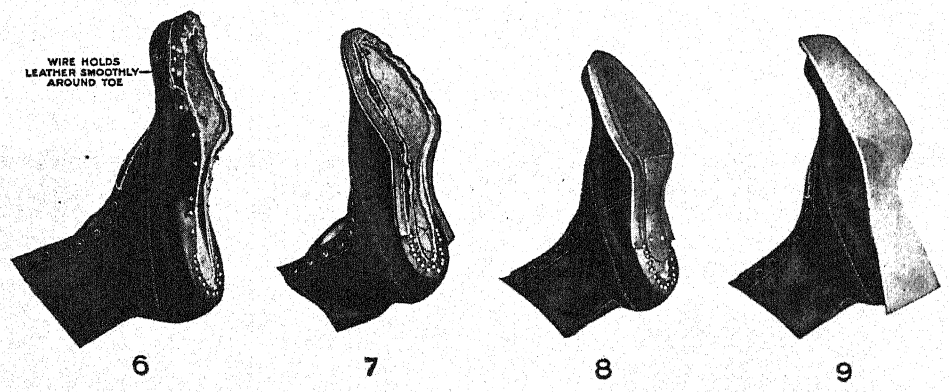
3

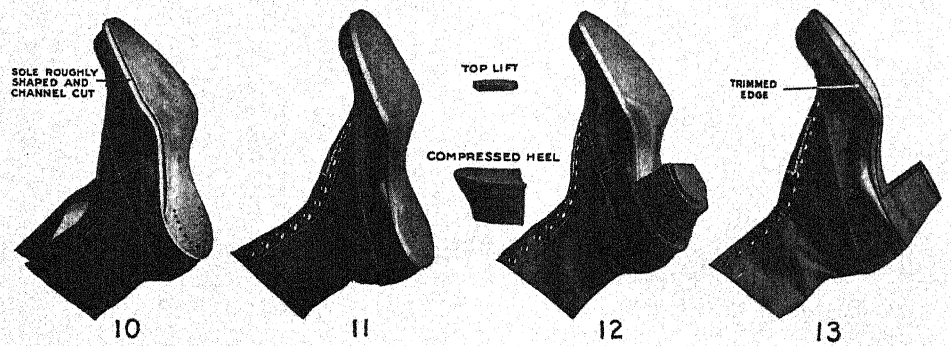


4

1. The Ideal Clicking Machine rapidly cuts out the parts of the upper according to patterns which have been prepared beforehand.
2. The Rex Pulling-Over Machine draws the upper smoothly down over the last and fastens it firmly so that the insole may be attached.
3. The Welt and Turn Shoe Machine sews the welt to the insole and the upper so that the insole can be placed in its proper position.
4. The Outside Rapid Lockstitch Machine sews the outsole to the welt. The work of this machine is shown in one of the smaller pictures.







1. Wooden last
2. Insole
3. Insole tacked on last and channel made
4. Upper
5. Upper on last
6. Upper tacked on
7. Welt sewed on
8. Shank placed
9. Outsole put on
10. Sole shaped and channel cut
11. Sole leveled
12. Heel put on
13. Heel trimmed

Pictures by courtesy of United Shoe Machinery Co.

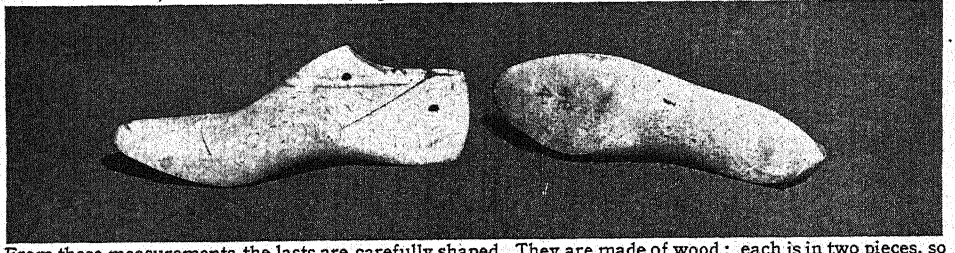
MAKING A PAIR OF SHOES BY HAND



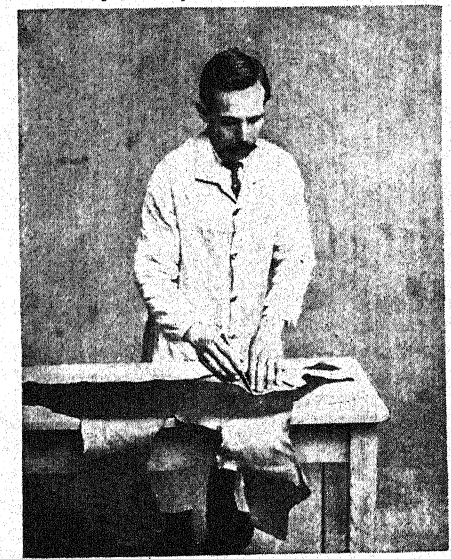
The shoemaker finds the breadth of our foot with a tape measure, and the length is taken with a curious rule called a size-stick, like the one shown lying on the floor.



He measures round the instep, ankle, and leg, and then we stand upon a piece of paper while he marks the outline of our foot with a pencil.



From these measurements the lasts are carefully shaped. They are made of wood; each is in two pieces, so that it may be easily drawn out of the finished boot. Iron lasts are sometimes used for machine-made shoes.



Now all is ready for making our shoes. First, the uppers are cut out of a skin of leather by a man called a clicker, who uses a sharp knife.



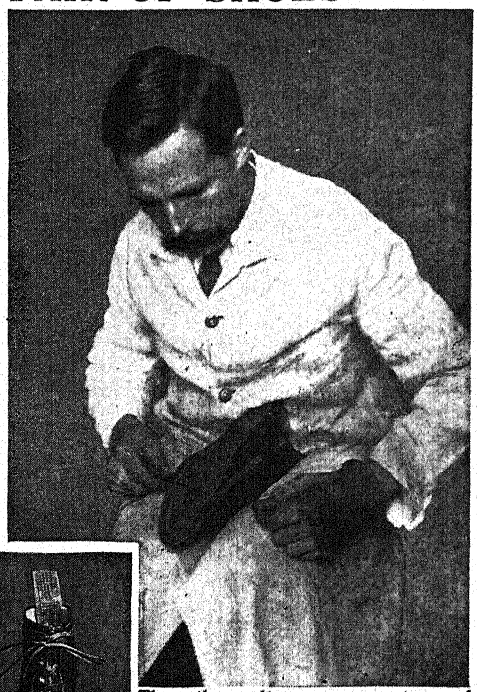
Then, after being fitted together and stuck with paste, the different parts of the uppers are sewn together by means of a sewing-machine, with specially strong needles.

BUILDING UP A PAIR OF SHOES

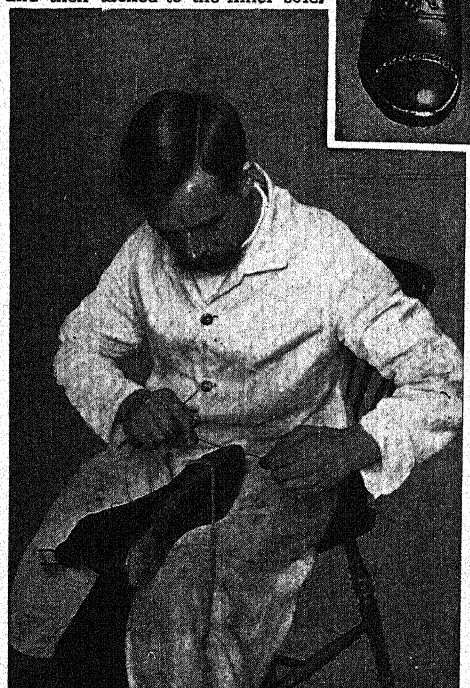


The upper is next lasted, or fitted on the last. The leather is pulled over the sole with a pair of pincers, and then tacked to the inner sole.

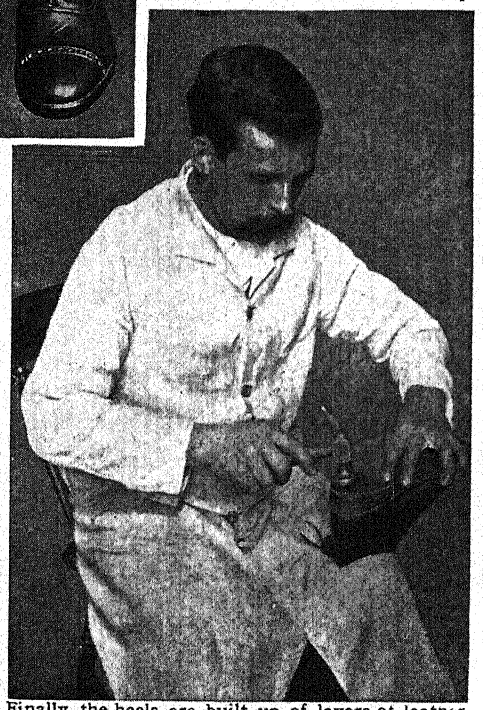




Then the welt, a narrow strap of leather to which the sole is fastened, is sewn on. In machine-made shoes the welt is attached differently.



Now the shoe is soled. Holding it in his lap, the man makes holes through insole, upper, welt, and sole, and sews all together with waxed thread.



Finally, the heels are built up of layers of leatner, soles and heels are blackened and polished, lasts drawn out, laces put in, and the shoes are ready

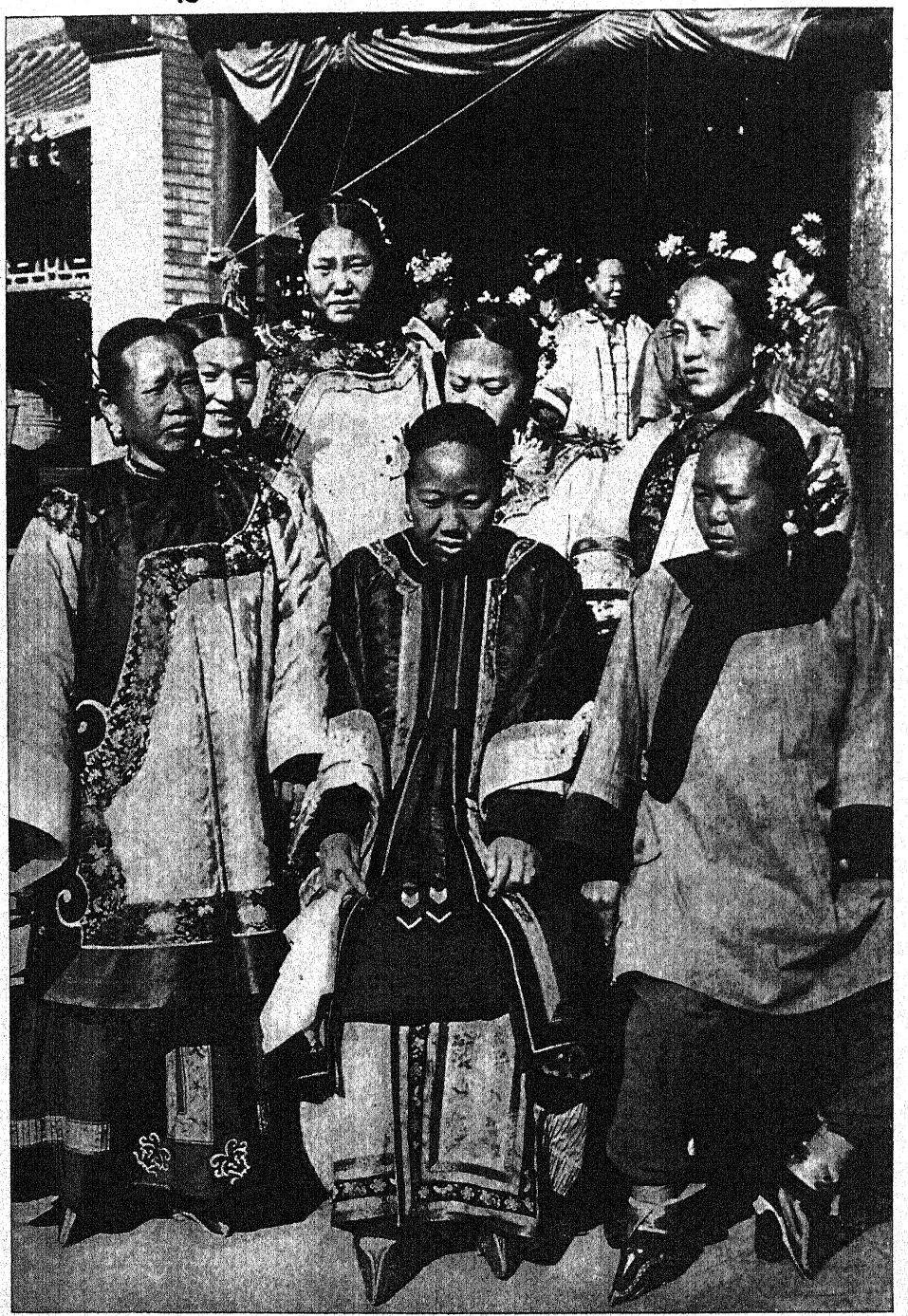
A SHOE WHICH MUST BE UNCOMFORTABLE



This picture shows a peculiar kind of shoe sometimes worn by the lower classes in India. They are probably the oddest shoes in the world, as they are only a flat block of wood with a large knob which slips between the first and second toes. It would seem that they must be exceedingly clumsy and uncomfortable. One certainly could not move very rapidly in them.

Photo copyright by Underwood & Underwood, New York.

SOME QUEER SHOES WORN IN CHINA



In this picture you see the tiny shoes of fine kid and silk embroidery worn by Chinese ladies of the upper classes in Canton. Notice the peculiar shape, the pointed toes, and the high heels. The horrible custom of foot-binding has only just died out and many Chinese women with deformed feet are yet alive. They can only totter along with great difficulty and discomfort.

Photo copyright by Underwood & Underwood, New York.



WHAT TO DO IN CASE OF FIRE

CONTINUED FROM 2998

FIRE is all right in its proper place, but altogether to be dreaded where it can burn people or destroy property. So those persons who know what to do and have the presence of mind to do it are invaluable when clothes catch fire, the lamp upsets, the chimney or curtains are alight, or the house is ablaze.

Little children are sometimes burned to death because they make a plaything of fire. They like to get hold of a box of matches and make a bright light by striking them; and then the dress may catch fire.

Suppose we have a little brother or sister, and one day when we are alone with him or her the clothes or hair catch fire, what ought we to do?

In the first place, we must stop the child from rushing about the room or out into the passages and open air, which he will try to do, for that would make the clothes burn all the faster; we must seize a rug, a shawl, a coat, a counterpane, a blanket, a tablecloth, a jacket, or any big piece of woolen material, and wrap it tightly round him. That will stifle the flames, and they will go out for want of air. If a rug is near, we should roll the child on the floor in it, covering our hands as much as possible, or they will be burnt too. If we cannot get a rug quickly, we should roll the child over and over on the floor. Anyhow, we must either press out or smother the flames, and if the window be open, get it shut as soon as possible.

Lamps upset sometimes, or the paper shade falls on one side and catches fire. The burning oil flares up, and there is not a moment to lose. If possible, the hands should be wrapped in a handkerchief, cloth, or leather, and we must then bravely take the lamp at arm's length and hurl it out of the window or into the grate, and sop up the oil. There is, perhaps, a tablecloth on the table where the lamp stands; the corners of it should be taken up, and the burning oil smothered with them. To pour water on the oil makes it blaze away more fiercely; but flour, sand, or earth will put out fire. It sometimes happens that the window of a bedroom is left open, and lace curtains are blown over a lighted gas-jet. In a moment the curtains are alight. Here is our best course of action now: We must first get on a chair and try to tear the burning curtains down, or, if we can do so, lift off the rods or poles. Then empty all the water at hand over them, or smother them with bed-clothes. As soon as possible we should shut the window and door to prevent a through current of air in the room. A siphon of soda-water squirted at once is a good thing to extinguish a small blaze.

Chimneys catch fire, usually because they are blocked up with soot, or the fire sets light to a beam of wood near by. We must first put out the fire in the grate by pouring water or throwing flour, salt, sand, or earth over it, and then hold a board, wet blanket, tablecloth, or piece of carpet before the fireplace to keep the fumes out of the room, and to shut off a current of air from below. If the fire is very bad and likely to set the house alight, the fire-engine must be called, and the firemen will probably get on the roof and block the top of the chimney to keep all air out.

Now we come to talk of a very dangerous state of things—a house on fire at night when people are in bed and asleep. Sensible folk talk over this and think what they would do if it ever happened. In a high building they usually have a long coil of rope or a rope-ladder ready to fix on to the balcony, leg of a bedstead, or a large piece of furniture, so that escape is possible by the window. Failing these precautions, sheets and blankets can be knotted together into reef knots at the corners, as described on page 251, and used as a rope to climb down, the mattress being first thrown out of the window to soften a possible fall.

Sometimes people wake in time to notice a smell of burning, and, of course, get up and find out the cause; but often the first they know of a fire at night is being choked by smoke. They wake up in alarm; but before jumping wildly out of bed and running downstairs, they should stop to think a moment and find out the place of the fire and its state. We will suppose the fire is very fierce

when we open the bedroom door. If other people are in the house, we must, of course, call to them. We can do that while wrapping a blanket around us, thrusting our feet into shoes and tying a wetted towel or handkerchief around our head and mouth. Suppose the passage is full of blinding smoke. We should not try to walk upright, but creep on our hands and knees the nearest way to safety—upstairs, if the staircase is alight below us; downstairs, if it is alight above us. The air is freest from smoke close to the floor. Houses are now built so that tall ones must have a skylight, an outside staircase, or some means of exit by which we can reach the roof.

If we are in a school or a public building which catches fire, there is not only danger of being burned, but risk of being crushed and trampled on when the crowd rushes wildly to get out through one or two doors. In schools fire-drills are often held, and the children march out, exactly as their teachers tell them to do. Everyone gets out in the shortest time possible, and there is no blocking of the passages; but when panic occurs in a hall or big public room, and people hustle and press towards the door, it is wise to look out for another way of escape, for there usually is one, a back or side door, a window to be reached by piling chairs on one another.

We should then break the glass and shout. Someone outside will probably see us or hear our cries and bring a ladder. If we are in the middle of the panic-stricken crowd, we are safest if we keep our head up, our arms doubled up in front of our chests, and our elbows to our sides. That gives us the best chance to breathe and resist pressure on the ribs.

THE WIZARD'S WAND AND THE MAGIC PURSE

AS soon as he aspires to give a regular "show," the young wizard will feel the need of a proper "wand." The young reader may probably have imagined that the conjurer's wand was like the cap and gown of his schoolmaster, merely an item of professional costume. But in truth it is much more than this, and serves several purposes.

Though the spectator may be conscious in his own mind that it is a mere piece of wood like any other, a mystic tap with the wand, for the professed purpose of causing some magical change, goes a long way to make him believe that the change was actually produced thereby. Further, when necessary, the owner is enabled, by grasping the wand, to keep the hand partially closed, and so to conceal some small object therein. If he desires secretly to pick up or lay down any article on his table, the picking up or laying down of the wand gives him the opportunity to do so.



The young conjurer should therefore cultivate from the outset the use of the wand. A handy boy can easily make one for himself. Nicely rounded rods of hard wood, three feet long, and half an inch thick, are sold by most hardware merchants for garden and other uses, at five or ten cents apiece. Procure one of these, cut from it a piece about twelve inches long, and cover this with black glazed paper. Over the last two inches of each end paste the same sort of paper, but white or cream in color, and we shall have a wand as good for practical purposes as if it were made of real ebony and ivory.

Having found our wand, we shall, as a general rule, come forward with it in our hand when about to begin a show. But we may now and then produce it in a more magical way. One very effective plan is to produce it from our purse, where we profess to keep it, along with our hard-earned pocket-money. Coming forward, and making a few introductory remarks, we look about us, as if seeking for something. "I am sorry, ladies and gentlemen, but I have mislaid my wand, and till I find it I cannot do anything. Ah! I remember now, I put it in my purse." And we produce it from our purse accordingly.

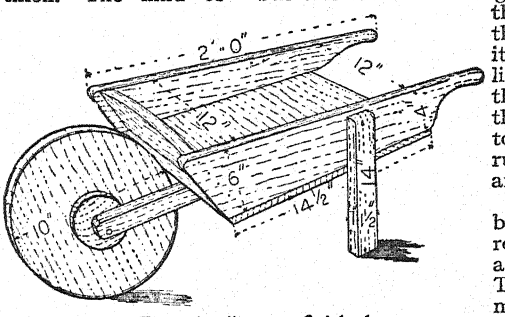
We have to admit that the last statement is not strictly true; but, however truthful we may be in private life, as a conjurer we have a sort of special licence to romance in this way; indeed, when one comes to think of it, a conjurer's whole performance is a sort of fairy tale in action. As a matter of fact, the wand is not yet in the purse, but is hidden in our left sleeve, its outer end resting against the lower joints of the bent second and third fingers. If the first and fourth fingers be left partially extended, the curvature of the other two will appear perfectly natural.

We have two purses, bag-shaped, and alike in appearance, as shown in the picture. One of these is unprepared, but the bottom seam of the other is ripped open for about an inch and a half, making a secret passage into the interior. The inner pocket remains intact, and in this we place a few coins: pennies, dimes, or quarters, according to the state of our finances. The other purse is left empty. The two are placed, one against the other, in the left trouser pocket. We must remember which we place outermost.

To work the trick, we place the left hand in the pocket, and take out the prepared purse. Transferring it to the right hand, we open it, and pour out the coins upon the table. Returning it, still open, to the left hand, and placing the fingers of the right hand inside, we get hold through the opening of the end of the wand, which we then proceed to draw out through the mouth of the purse. If we do this boldly and neatly, standing meanwhile with our left side turned towards the spectators, no one can detect that the wand comes from the sleeve. When the wand is clear we close the purse, put it back into the pocket, and remove the hand. Then, as if bethinking ourselves, we say: "I mustn't forget my money, though." So saying, we thrust our hand into the pocket again, and bringing out the *unprepared* purse, place the coins therein. We must not offer it for inspection, but if any inquisitive person asks to examine it, we may safely let him do so.

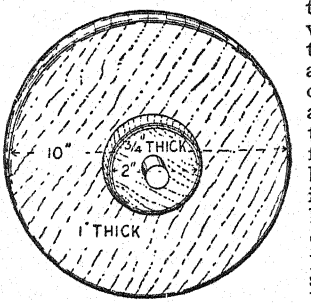
HOW TO MAKE A WHEELBARROW

THE wheelbarrow shown in picture 1 is designed to give as little trouble as possible in making. It is a toy wheelbarrow suitable for boys, and when made will be found most useful. The wood used in the sides, bottom, and front is three-quarters of an inch thick. The wheel, legs, and axle-bearers are one inch thick. The kind of wood used is ordinary pine. It should be planed all over, and the barrow, of course, will look better if it is painted.

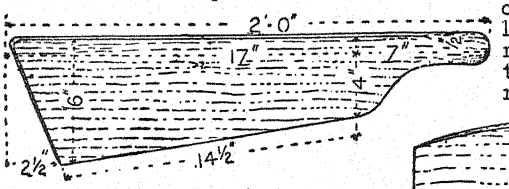


1. The wheelbarrow finished.

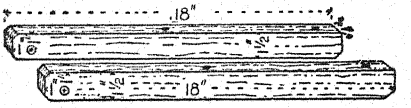
The wheel by itself is shown in picture 2. To make it, we take a piece of wood one inch thick, and large enough to mark on it a ten-inch circle, which represents the diameter of the wheel. We mark the circle and then saw round outside the line with a bow-saw or a keyhole saw. Another way is to cut the corners off with a tenon saw and then finish to the line by paring with a chisel. In both cases a chisel should be used after the saw to cut exactly to the circle, and after the chisel a spokeshave may be used to remove chisel-marks and to round the edges slightly. A wood-turner would make the wheel for a few cents, and it would be much better made than if made with a saw and chisel. Bosses, or side pieces, about two inches in diameter by three-quarters of an inch thick, are put on each side of the wheel as shown. Their purpose is to keep the sides of the wheel from rubbing against the pieces in which the axle-ends fit. The bosses in the picture are shown of round shape, which is neatest, but they will do quite well if they are not round, but square or of any other shape. They should be nailed on exactly in the centre.



2. Wheel of barrow.



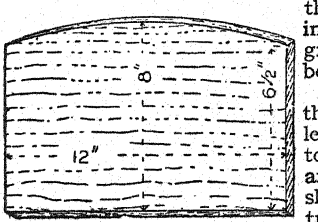
3. Side of body.



4. Axle-bearers.

The next thing is to fit an axle. This must be put into a hole bored through the wheel, and must fit rather tightly and stand out one inch at each side. A piece of quarter-inch wire, four and a half inches long, or a piece of ferrule about half an inch in diameter, will be best; but if these cannot easily be obtained, a wood axle made from three-quarter-inch or half-inch birch dowel-rod will do instead. The hole through the wheel should be bored half-way from one side and half-way from the other, and great care should be taken to start exactly in the centre of the wheel. It is probable that the holes will not meet quite in line, but this will ensure a tight fit for the axle. If the hole is bored right through from one side it is certain to come a little out of centre on the farther side, and this will cause the wheel to wobble instead of running truly with its axle.

For the body of the barrow two pieces are required for the sides, as seen in picture 3. The handle part is marked to a suitable shape roughly by free-hand, and worked with chisel and spokeshave. To get both sides alike one should be cut first and the other marked from it by placing them together and marking round with a pencil. The piece for the bottom is sawn fourteen and a half inches long and nailed on the under edges of the sides, as in picture 1. The piece for the front, shown in picture 5, fits between the sides, and its bottom edge is beveled to allow it to slope. As the sides of the barrow are parallel in both directions, the ends of the front piece simply have to be made square. Its top edge will look better if it is curved as shown. The size and position of the legs is shown in picture 1. They are fourteen inches long, one and a half inches wide, and one inch thick, and have their top outside corners curved a little so as to look well. The best way to nail them is from the inside of the barrow, but one or two nails may be put through from the outside into the end grain of the bottom.



5. Front of barrow.

The only thing now left to do is to make the axle-bearers, shown in picture 4, and put them on with the wheel between them. They are the same width and thickness as the legs, but are eighteen inches long. The holes for the axle are bored towards the lower edge because the wood above has to bear the weight of the barrow. The axle-ends should be an easy fit in these holes. They may be eased out

and smoothed with a red-hot poker if the hole bored with the bit is too small. A little grease should be used afterwards to make the axle run easily.

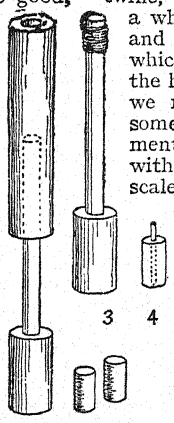
The best way to attach the bearers to the bottom of the barrow will be to screw them, and it will be easier to put screws two inches long through the bearers into the bottom than through the bottom into the bearers, though the latter way would be a little stronger. Turn the barrow upside down and lay the bearers, with the wheel between them, on it. Adjust them in the middle of the barrow and parallel with its sides, so that the edge of the wheel is about half an inch clear of the front of the barrow. Screw-holes should be bored through the bearers before this is done. No holes need be bored in the bottom, or only very small ones as a guide for the screws, and they can be made while the bearers are in position during screwing. The wheelbarrow is then completed, except that it may be given two coats of paint of any particular color or colors that may be desired.

THINGS WE CAN MAKE FROM AN ELDER BRANCH

WE all know the common elder-tree which grows by the wayside, more like a big bush than a tree. It grows very quickly, and the juicy shoots soon harden into good, tough wood. If we take one of these and examine it we shall find that the shoot, or branchlet, is really a wooden tube filled with pith, which can be easily taken out, and quite a number of interesting things can be made from the tube.

First of all we can make a popgun, and for this purpose we must take a straight length of thick elder wood. We can push the pith out with an iron rod, if there is one handy, or, if there is not, with a rod made from a piece of oak, ash, pine, or any tough wood. This will afterwards do for the ramrod of the gun.

We must make this rod six inches longer than the gun, and must leave a shoulder, or thick part, to prevent the rod going right through the barrel. Picture 1 shows how this rod, or plunger, works. With knife, glass, and glass-paper, we make the rod nicely smooth and straight, for it must move comfortably in the barrel, being neither too tight nor too loose. If it be too tight it will split the barrel, and our work will be spoilt, and if it be too loose our popgun will not work. Before pushing out the pith we must rub the rod with soap, and, if necessary, tap the end of the rod with a piece of wood. When the rod is nearly through, the pith will spring out from the other end of the barrel. Then wrap a piece of sand-paper round the ramrod, tie it on at the shoulder end, and work it through the barrel from both ends. This will clear the inside and make it smooth. Now, if we take two small corks, shaped like those in picture 2, that fit the tube tightly, soap them to make them work easily, and put them in the end of the tube, we can fire them out by pushing the ramrod down quickly.



1 2 3 4

1. Popgun. 2. Corks. 3. Plunger. 4. Tube for syringe.

Next, if we tie a little worsted tightly round the end of the plunger, as shown in picture 3, and insert a tube or quill into one of the corks, as in picture 4, and fix the cork with the quill firmly into the end of the barrel, we shall have a most effective garden syringe. To make the necessary hole in the cork we burn it through with a red-hot iron skewer. It is best in this case to bind the outside of both ends of the barrel with twine, so that it may not split. To make a whistle, remove the cork with the nozzle and blow across the top hole of the gun, which we hold with the left hand. With the handle of the plunger in our right hand, we may, with practice, be able to play some simple tunes. We play the instrument in the same way that we should whistle with a key or with pan-pipes, making the scale by pushing the plunger up or pulling it down the barrel.

We can do something, too, with the pith which we took out of the tube. We first of all need a very sharp knife, and of course we must take care of our fingers. From a small piece of pith, about an inch and a half long, we cut a slice off both sides, and then sketch a design for the figure of a man upon the flat surface of the pith. Next we carefully trim away the pith with our knife until we have the shape that we want. Suppose we decide to make a little sailor boy as shown in picture 5. The cap and arms may be made of separate pieces of pith and stuck to the body. After getting the figure ready in this way, we paint the hands and face a nice pink, the jersey white, the jacket blue, the trousers white, and the boots black. The cap can be white, with a band marked "Nelson," for the name of the sailor's ship. This name we print with Indian ink or gold paint with a mapping pen. We must be sure to give the boy bright, laughing eyes, a well-shaped nose and chin, rosy cheeks and red lips. If we do all this our sailor lad will look a fine, brave fellow, quite ready for action. We make a base for the sailor to stand upon by cutting a large round leaden bullet in half with an old knife.

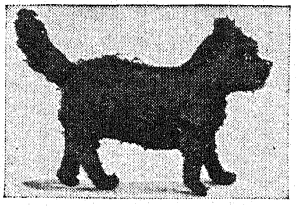


5. Pith sailor.

Of course there are all kinds of figures we can make out of the pith, soldiers, policemen, postmen, nurses, and the like, and we can also model little animals and birds, and color these as we find them in Nature. In fact, if we are careful we shall get skilful enough to make a whole collection of quaint and dainty little articles that will be very interesting and amusing to us and to our friends.

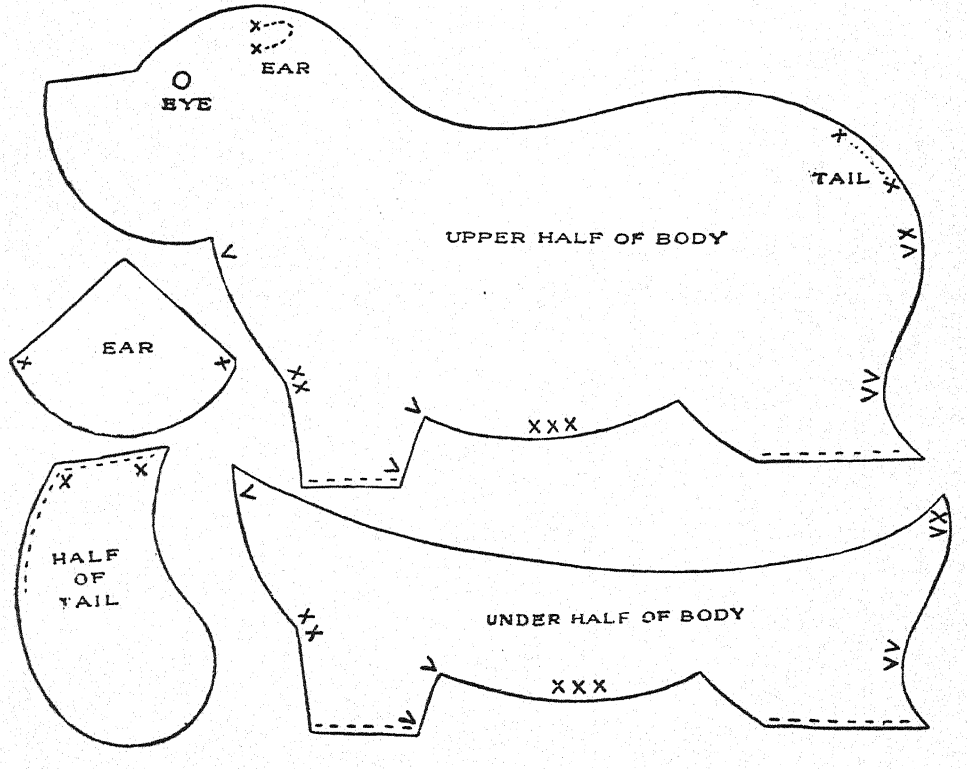
A DOG FOR OUR TOY ZOO

THE dog which is shown in the picture was made of a piece of curly brown astrachan cloth, but if you are going to trace this pattern, and not enlarge it, you should choose a less clumsy material. He has no nose-piece, and the leg-pieces are cut off, like the lion's, a little below the body, and left open at the dotted line. The wood for each leg is about two inches long, and as thick as a *thin* slate-pencil. It is wrapped in a piece of the stuff half an inch longer than itself at one end, and securely fastened to the wood at the other, so that the little stick cannot slip out of its case, as described for the making of the lion. Astrachan does not fray, and may, for the legs, be sewn raw-edged on the right side. The piece of stuff that is too long must be rounded off, sewn round, and caught back by a stitch or two at right angles with the leg to form the foot. When you fix the legs into the holes left for them, be careful that the toes all point the right way. The edges of the thigh parts may be carefully hemmed down raw-edged on to the leg, and any of the thigh part that is too large must be kept to the back, and stitched across to form a joint.



The dog for our toy Zoo.

The dog's tail can be stitched up on the wrong side, and if it is left open at the dotted line it can be turned, and after a little stuffing has been put in, this opening can be finished on the right side. The tail should be put on before the back seam is stitched up. The dog's ears are left raw-edged, and not lined. The nose is a bead, sewn on and covered with glue, in which two nostrils are pierced with the point of a pair of scissors while it is soft. The eyes are jet beads, and the mouth is shiny black thread.

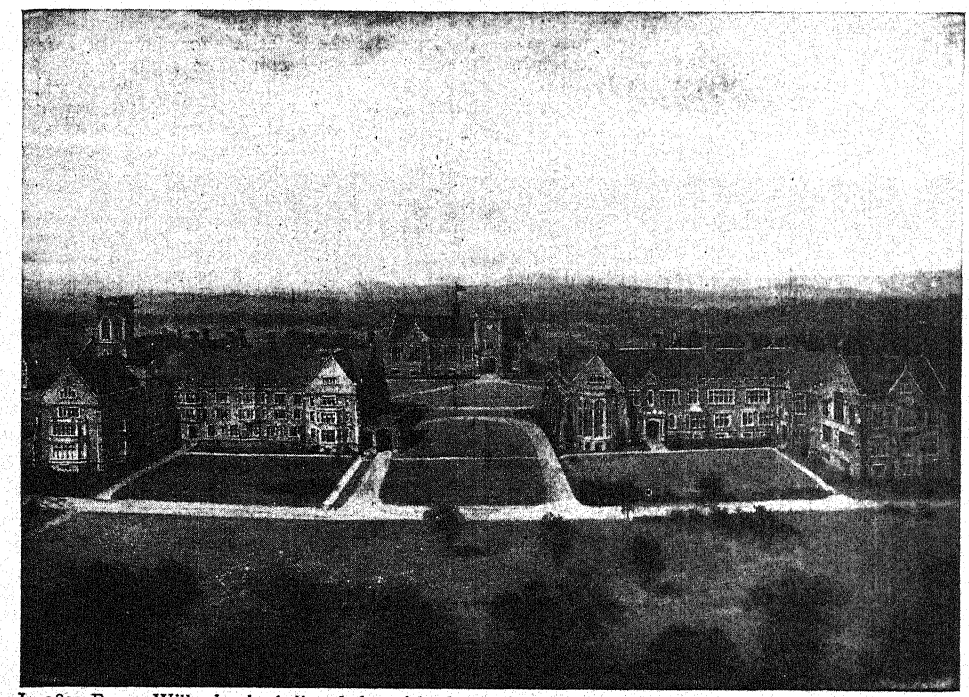


A GAME WITH MUSIC

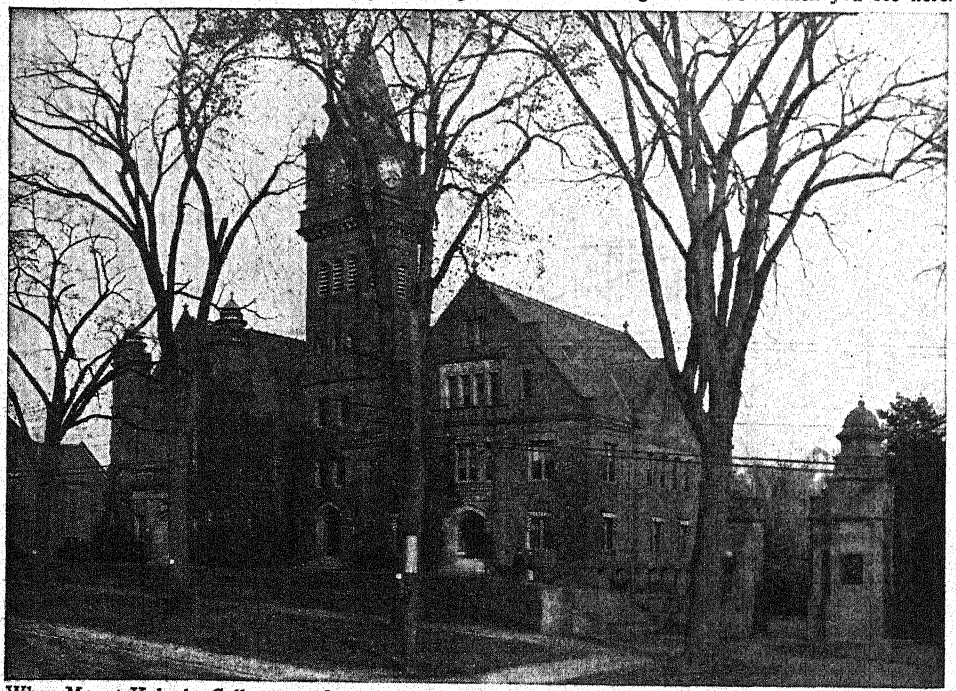
MAGIC MUSIC.—One player goes out of the room, and the others decide upon some object, unknown to him, which he is to pick up. He returns to the room, and a skilful player at the piano guides him to the object by playing softly when he is far away from the object and more and more loudly as he gets nearer to it. When he is right before the object —say, one of a number of ornaments on a table —the music is, of course, loud, but if he picks up the wrong ornament it quietens down. A great deal depends upon the intelligence of the pianist in grading the music according to whether the searcher is " hot " or " cold," but, given a skilful player and an intelligent searcher, it is astonishing how quickly the object decided upon is found.

THE NEXT MAKE AND DO SECTION IS ON PAGE 3211.

SCHOOLS FOUNDED BY FAMOUS WOMEN



In 1821 Emma Willard, who believed that girls should be as well taught as boys, opened a school for girls in Troy, New York. This school, which was the pioneer of all the high schools for girls in the country, was very successful. Its name was afterward changed to The Emma Willard School, in memory of its founder. From its first small beginnings it has grown to be the large institution which you see here.



When Mount Holyoke College was first opened, its founder could not have foreseen the great educational movement which was to grow from the small beginning which she made. Mary Lyon founded Mount Holyoke Seminary, the pioneer of all the colleges for women in the United States, in the year 1837, and later the name was changed to Mount Holyoke College. One of the college buildings is shown here.

WHAT THIS STORY TELLS US

IN these days women may be doctors, lawyers, artists, architects, or may engage in any other profession or occupation that they choose. Women may hold property in their own names, and may travel alone and unattended without fear from one end of the land to the other. It was not always so, and this story tells us something about the lives of a few of the leaders who won the freedom of action that the women of our country now enjoy, and the hardships and unkindness they had to face in doing it. We read here of women who cared for the sick and dying in time of war, of the first woman doctor in the United States, of a woman who founded a church, and of a girl who in spite of the fact that she was blind and deaf went to college, and learned the things that girls who have all their powers sometimes find it hard to do. We feel proud of this girl, and her example sometimes helps us to be cheerful when we feel our tasks are hard. There is no woman, mentioned here, of whom you should not know.

FAMOUS WOMEN OF THE UNITED STATES

CONTINUED FROM 3054

IN our time there is no study which a woman may not undertake and there are few occupations in which she may not engage. In most of the states of the Union the laws which did not allow married women to keep their own property, or to have any right to their own earnings, or to be guardians of their children, and other laws which treated women as if they were children, have been repealed. In a number of states women have the full right to vote, and there is even a woman member in the House of Representatives.

This state of affairs would have seemed not only very strange but very wicked to our forefathers. When the first settlers came over from England they did not change their beliefs and opinions, and one of their most deeply rooted convictions was that women were inferior in all ways to men. Women did the work of the household. They cooked and baked and washed. They were the spinners and weavers and dyers of the community. They made clothes for their families from cloth of their own weaving. They cared for the poultry, brought the cows from the pasture, milked them and made the butter and cheese, and too often they were literally the hewers of wood and drawers of water. Of course if their husbands were rich they had slaves or servants to do these things, but the general belief was that women and girls needed plenty to do to keep them out of mischief. Both men and women however thought that a woman should never be heard of outside of her own home, and the idea that a woman might enter a profession or adopt an artistic career would have shocked them deeply.

Nevertheless, there were some notable women in early times, and at least one—Anne Hutchinson—is famous.

ANNE HUTCHINSON, WHO ALMOST DIVIDED A COLONY

Anne Hutchinson was born in England about the year 1590. She and her husband, John Hutchinson, were great admirers of the Reverend John Cotton, and when he came to this country, they followed him. They settled in Boston, where Mrs. Hutchinson gained great influence. She began to give religious teaching herself and won the support of John Cotton and the governor. The clergy of the colony, however, did not like the idea of allowing a woman to teach and preach. Mrs. Hutchinson's views did not meet with their approval, and fearing that she might lead some of the people astray, they held a convention before which she was tried for

Copyright, 1918, by M. Perry Mills.

heresy. She was condemned and sentenced to banishment from Massachusetts. Unless she went back to England, she had nowhere to go except to the wilderness. She chose the wilderness, and with her family and friends journeyed to Rhode Island, where Roger Williams had already started a little colony. The Hutchinsons made a new settlement; but after her husband's death Mrs. Hutchinson moved to the shore of Long Island Sound, near what is now New Rochelle, in New York, where she and all her family, except one daughter, were murdered by the Indians. When the stern Puritans of Massachusetts heard of the tragedy, they said it was a manifestation of divine Providence.

Anne Hutchinson had an extraordinarily clever mind; but in the age in which she lived, she was not able to make full use of its powers. It is probable there were other clever women in the colonies in her day, but none of them did anything of sufficient public importance to claim mention. Of some of the famous women of Revolutionary times—Martha Washington, Abigail Adams, Betsy Ross and Dolly Madison—we may read elsewhere and shall go on to times that come nearer our own.

Until a number of years after the Revolution, it was not thought necessary that girls should have much education. They were taught reading and writing, a little arithmetic, a smattering of geography and grammar, and, generally, very little spelling. If their fathers could afford it, they probably went to a "young ladies' finishing school" where they were taught a little French and drawing and perhaps taught to sing a few songs and to play a few tunes on the harpsichord or piano. A girl learned, of course, to do exquisite sewing, and spent long hours over her embroidery frame, but if by chance she learned Latin and Greek with her brothers, she was termed a blue-stocking, and men and women alike fled from her company. There was nothing even approaching a high school for girls until Emma C. Willard opened a school at Troy.

EMMA WILLARD, A PIONEER OF EDUCATION FOR GIRLS

Emma C. Willard, whose maiden name was Hart, was born about ten years after the Revolution, in Berlin, Connecticut. She was a clever girl and learned quickly. When she was sixteen she became a teacher in the village school, and before she was twenty was principal of an academy for girls in Middlebury, Vermont. In a few years she married Dr. James Willard of the same town, but did not give up the work to which she had devoted herself. In the year of her marriage, she opened a boarding school for girls, into which she introduced more thorough methods of teaching. In 1821 she opened a seminary for girls at Waterford, N. Y., for which she received state aid. Her ideas gained ground, and in time she won the approval of such men as Governor Clinton of New York, who supported her by his influence. The school, which from the first was successful, was moved to Troy, N. Y., and, as the Emma Willard School, it is still well known. Mrs. Willard wrote geography and history for schools, an account of a tour in Europe, and some poems, of which the best known is the song "Rocked in the Cradle of the Deep." She is best remembered, however, for her work in the education of girls, in which she was so much interested that she helped to found a school for Greek girls in the ancient City of Athens. Greece, you remember, gained independence of Turkish rule in the first half of the nineteenth century. Mrs. Willard died in 1870 and some years later the city of Troy erected a statue in her memory.

THE WOMEN WHO BEGAN THE FIGHT FOR WOMAN SUFFRAGE

Lucretia Mott and Elizabeth Cady Stanton are remembered as the women who made a little ball of the question of woman suffrage and set it rolling to catch public opinion. Lucretia Mott died before women were allowed to vote in any country, but Elizabeth Cady Stanton lived to see suffrage given to women in New Zealand and the Commonwealth of Australia.

Lucretia Mott, whose maiden name was Coffin, was born in 1793 on Nantucket Island. She was educated at a good school, near Poughkeepsie, in New York, which had been established by the Society of Friends, who from the first had been interested in the education of girls, and she later on became a preacher in the Society. In 1818 she married James Mott, who was a strong supporter of the movement for the abolition of slavery, which even then had begun to

gain ground. Mrs. Mott's interest was aroused. She joined her husband in his work, and much to the dissatisfaction of some of the members of her own denomination, she became prominent in the movement.

In 1840 she and her husband were sent as delegates to an anti-slavery convention in London, but she was not allowed to take any part in the meetings, as it was declared that all women should be excluded. With the gentle indignation of a Quaker, she discussed her exclusion from the meetings with her friend Elizabeth Cady Stanton. It led to the opening up of the whole question of "Woman's Rights," and the result was the first woman's rights convention, which was held at Seneca Falls, in New York State, in 1826. From that convention grew the wide movement through which women have gained either the right to vote, or a promise of its grant, in most of the civilized nations of the world.

Mrs. Mott worked hard for woman suffrage almost to the end of her life, which closed in 1880, when she had almost reached the age of ninety. Her friend Elizabeth Cady Stanton, who was a much younger woman, outlived her by many years.

MRS. STANTON, WHO CARRIED ON THE WORK OF MRS. MOTT

Elizabeth Cady Stanton was the daughter of a lawyer named Daniel Cady, who was a member of the House of Representatives when his little daughter was born in 1815. She first went to school in her native town of Johnston, in New York State, but later on went to Troy, to the school which had been founded by Emma Willard. When she was about twenty-five she married a lawyer, Henry Brewster Stanton, who was a prominent abolitionist. On their wedding trip, the young people went to London, and there Mrs. Stanton met Lucretia Mott. In her indignation at her friend's dismissal from the anti-slavery meetings she became very much interested in the question of women's rights and afterwards assisted Mrs. Mott in calling and holding the first women's rights convention, at which a National Woman's Suffrage Association was formed. Mrs. Mott was made president of the association, and held this position for many years. She was instrumental in having a law passed, in the New York legislature, giving married women the right to hold property in their own names. Up to the time that this law was passed, when a woman married, if she had a house or land of her own in New York State, it became her husband's property unless it was put in the name of trustees. Mrs. Stanton lived until the year 1902, and throughout her long life did much for the cause of woman suffrage. With Susan B. Anthony, another famous woman suffragist, she wrote a History of Woman Suffrage. These three woman were the first leaders of the little band who braved jeers and ridicule to win the freedom that women enjoy. Now that the battle is won it is easy to be a woman suffragist. The women who began it had a long, hard fight. It took courage of a rare kind to face, as they did, ridicule, and often the brutal abuse of a laughing, jeering world, to endure isolation, and to bear the pain of broken friendships.

A WOMAN FOUNDER OF A CHURCH

From early times, and in many countries, women have been active in religion, but it remained for an American woman, Mary Baker Eddy, to found a new faith. Her father, Mark Baker, who was descended from one of the earliest settlers, had a farm near Concord in New Hampshire, and there all his children were born. Mary Baker, who was the youngest of the family, was born in 1821. She was a beautiful child, but nervous and very delicate, and had to be taken from school at an early age, because of her health. She was studious, however, and learned a good deal at home, especially, it is said, from a favorite brother, who was a student at Dartmouth College and who afterward became a promising lawyer. The death of this brother at an early age was a great grief to the sensitive child. Later on her father gave up his farm and moved to a neighboring village, where she went to another and better school for some time.

In her early womanhood she married George W. Glover, a friend of one of her brothers, and with her husband went to live in Charleston, in South Carolina, where he carried on his business. Her happiness was quickly ended. Within a year her husband died, and she went back to live with her parents. Her health had never been strong, and after her husband's death she was for many years an

invalid. She was unable to care for her little son, who was brought up by friends. They took him with them to the West, and she saw little of him either in his childhood or after he had grown to manhood.

In her hours of enforced quiet, she pondered much on the problems and mysteries of life. After years of thought she arrived at the belief which she called Christian Science, and which she afterward embodied in a book called Science and Health With Key to the Scriptures. Having gained the health which had been denied her all her life, she began to teach others, because she felt that she had learned something that all should know. She published her book in 1875, and shortly afterward was married to one of her students, Asa Gilbert Eddy, by whose name she is best known.

A little later Mrs. Eddy founded the church known as the First Church of Christ, Scientist, in Boston. From this beautiful "Mother Church" have grown many branch churches, and the believers in the faith that she founded are to be found in great numbers all over the United States, and in many other countries.

After some years she was again left a widow, and again went back to New Hampshire, where, with a short interval spent in Boston, she lived in her beautiful home in Concord until the close of her life in 1910.

THE BEGINNING OF HIGHER EDUCATION OF WOMEN

The first famous teacher, after Emma Willard, of whom we read, is Mary Lyon, who was born on a farm near Buckland, Massachusetts, when Emma Willard was about ten years old. She began to teach in a little red schoolhouse when she was only seventeen years old. She stayed there for three years, and then went back to school to learn more. Thus she went on, sometimes teaching and sometimes studying, until she had learned all that was taught to girls in her time. Then she determined to found a school where girls who were not well off could go and study without having to stop, for months or years at a time, to earn money, as she had had to do. Friends came to her assistance, and Mount Holyoke Seminary, the first institution for the higher education of women in America, was opened in 1837.

It was poor at first. Mary Lyon as principal only drew a salary of two hundred dollars a year, and for many years the students did most of the household work of the school themselves. This did not hinder them apparently from studying well. The fame of the school increased, and in 1888 it became Mount Holyoke College. Mary Lyon died in 1849 and was buried in the grounds of the school which she had made the pioneer of all the colleges for women that have since come into existence in the United States.

WOMEN WHO DID WORK FOR THE RED CROSS

Two women who became famous at the time of the Civil War were Mary Livermore and Clara Barton, who were both born in the year 1821, in Massachusetts. Clara Barton's fame, because of her work for the Red Cross, was international, but the work done by Mary Livermore was also very important. Both of these great women commenced life as teachers, and both engaged in the relief of the soldiers during the Civil War.

Mary Livermore, who was born in Boston, and well educated in that city, taught for some time after her graduation in her old school. Then she went down to Virginia to teach and after three years spent there went back and taught again in her own state. After a time she married a clergyman, who, like herself, was strongly opposed to slavery, and with him she took an active part in the societies which were working to abolish it.

After the war broke out, she became a member of the United States Sanitary Commission, which did the same work for the soldiers that is now done by the Red Cross and the Y. M. C. A. She traveled about the country to rouse interest in the work of sending food, and much needed bandages and other supplies to the hospitals; organized aid societies in which women gathered to make comforts for the soldiers, and visited the army hospitals in the Northwest.

She was not only a woman suffragist, but also one of the few who argued against the use of alcohol in the days when it took a great deal of courage to belong to a temperance union. After the war she went about the United States and Great Britain to lecture. She wrote books and temperance stories, and for many years edited a magazine.

When the Civil War broke out, Clara Barton, who had had to give up teaching because of ill-health, had a government clerkship in Washington. She saw the need for nurses, however, and gave up her work to go into the hospitals to nurse the wounded soldiers. While she was engaged in this work, she came in contact with people who went to the hospitals to search for husbands or sons, of whom they could find no trace, and her heart ached at the sight of the added sorrow felt when a wife, or father, or mother, could gain no knowledge of the fate of their loved ones. So when the war was over she set to work to search for missing soldiers and thousands of grateful hearts blessed her because through her agency they were able to find the place where their soldier heroes lay at rest.

She was in Europe at the time of the Franco-Prussian War, and at once joined the Red Cross and went to the aid of the wounded and the needy. The rest of her life she spent in the service of the Red Cross, which she founded in the United States. Her influence was strong enough to have its work extended, and the constitution of the society was changed so that it can go to the aid of sufferers from any great calamity as well as to nurse the wounded and relieve the needy in time of war. She lived to the great age of ninety-one and only died in the year 1912.

THE FIRST WOMAN DOCTOR IN THE UNITED STATES

In the days of our great-grandmothers women nursed their own families, and went to the help of their friends. But though the mistress of the household often dosed her own and her neighbors' families, and her slaves if she had them, with bitter medicines that she brewed herself from herbs which she gathered in the fields and woods, she was not allowed to become a doctor. The mere rumor that a woman had an idea of studying medicine would have been enough to set the community buzzing with gossip. No physician would take her into his office to study, and in the whole world there was not a college that would let her enter its doors as a student. It took a great deal of courage, of a very high kind, to sustain the first women students through the abuse and ridicule with which they were greeted when they first attempted to break into a field which, it was thought, their brains were not well enough developed to enable them to till. This courage was possessed in a high degree by Elizabeth Blackwell, the first woman doctor in the United States.

Elizabeth Blackwell was born in Bristol, England, in the year 1821, and when she was about eleven years old was brought by her parents to this country. Like many other women of her time, she began life as a teacher, but after a few years she determined to become a doctor. She tried to gain admission to a medical school in Philadelphia, but in vain. Two of the doctors in Philadelphia, however, let her study with them, and in 1847, after many difficulties had been placed in her way, she was permitted to enter the Medical College at Geneva in New York State. She won not only high honors from her college, but the deep respect of her fellow students, and after her graduation went to Europe, where she studied in hospitals in Paris and London. In Paris, the hospitals at first refused to admit her to study unless she wore men's clothing. This she refused to do, and her quiet persistence won the day. She spent some time abroad and then returned to New York, where she practised her profession, and helped to found the Infirmary for Women and Children. After a time she went back to her native country, and lived in London until her death in 1910. Although a large part of her life was spent in England we number her among the famous women of America because she opened a door through which many other women have followed her.

THE FIRST WOMAN WHO BECAME A SUPERINTENDENT OF SCHOOLS

Women now hold so many offices in public life that it is a little strange to remember that the first woman who was appointed school superintendent in a great city recently died. This is Ella Flagg Young, who was born in Buffalo, in 1845. When she was a child, her parents moved to Chicago, where she went to the high school. From the high school she went to the normal school, and when she was about seventeen she began to teach in the public schools. She was married to William Young in 1868, but continued to teach. In turn she rose to be principal, then district superintendent, then professor of education at the University of Chicago, and later was made principal of the Chicago Normal School.

In every position she held she showed great ability. The schools in Chicago had been much hurt by friction between the trustees and the teachers. The education of the children suffered in consequence, and, in 1909, Mrs. Young was appointed superintendent to see what she could do to remove the difficulties. Very quietly she brought order out of chaos. Under her leadership trustees and teachers alike gained a fresh realization of their responsibilities, and the schools again began to flourish. After six years as Superintendent of Schools in Chicago, she resigned, and after doing valuable work for the government, died in 1918.

A GIRL WHO WITHOUT SIGHT OR HEARING LEARNED TO SPEAK

The next famous woman of whom we shall speak is known all over the world not so much for the things she has done as for the difficulties she has overcome in learning to do the things which children who have all their senses can be taught with ease.

To children who can play and sing, who can run about and see the beautiful trees and flowers, the faces of father and mother, and loving friends, who can look up at the blue sky, and hear the birds sing, the thought of being blind, or deaf, or dumb comes as the thought of a calamity that can scarcely be comprehended. And yet some children can neither hear nor speak, some children cannot see, and a few can neither see nor hear nor speak. Think of the sadness of such a state. Think of a bright spirit being shut up in a dark prison, unable to have any communication with the outside world.

Helen Keller was shut up in such a prison. She was not born blind, or deaf, or dumb. Until she was two years old she was like any other healthy, happy baby, and then a dreadful fever came and burned away her sight and hearing. The remembrance of the words she had learned fell away, and she could not speak. Soon she became strong and well again; but with what a difference! The once bright, happy child was closed around by a wall of silence, and as she grew older, her efforts to express herself often ended in wild, uncontrollable bursts of passion.

Her parents heard of the wonderful work that had been done at the Perkins Institute in Boston for another child who was afflicted in the same way as their little daughter. They sent there for a teacher and Miss Anne Sullivan came to be teacher, playmate and friend to poor little Helen. How the child was taught to read and write and spell is too long a story to tell here. Her joy when she learned the names of things was so great as to be almost painful, and after that she made rapid progress.

When she was ten years old she learned to speak by feeling the vibrations of her teacher's throat. She learned several languages and mathematics. With Miss Sullivan as companion, she went to school and, in spite of all the obstacles in her path, was ready for college in her twenty-first year. She chose to enter Radcliffe College, and took her degree there in little more than the usual number of years. She has written three books and takes an active, happy interest in all that happens in the world, and in the work that goes on around her.

THE FIRST WOMAN ELECTED TO THE HOUSE OF REPRESENTATIVES

Probably the pioneers in the woman suffrage movement scarcely hoped that women would be allowed to sit in Congress before generations had passed. Yet their work was so well done that in 1916, within a few years of the death of Elizabeth Cady Stanton, Miss Jeanette Rankin was elected a member of the House of Representatives from the state of Montana, and took her seat without opposition. She speaks well, in a pleasant, cultured voice, fills the place with dignity, has never asked for any privileges on the score of being a woman, is a hard worker, and very quickly gained the respect of all the other members of the House although there is no doubt that at first many were inclined to resent her presence.

In other places in the book, we have told about women writers, artists and musicians of the United States. There are many other noted women who have done, and are doing good work for their country and for the world. But in this story we have only space to tell of the pioneers,—the women who, oftentimes with much suffering of spirit, broke the way that made it easier for other women to be brave, and self-supporting instead, as in times past, of being often compelled to spend useless lives, dependent upon their fathers or brothers.

THE NEXT STORY OF MEN AND WOMEN IS ON PAGE 3133.



These broken stone pillars are the petrified remains of a huge forest in the State of Arizona.

Copyright by Underwood & Underwood, N.Y.

FORESTS AND DESERTS

CONTINUED FROM 3036

WE have learned that the greatest forces which make the history of the earth are the deepest. Those that do most make the least noise, and it is only after long study and thought and work that we recognize them, largely because things that are nearer the surface catch our eye. In just the same way it is the mothers and the fathers, and their relations to their children, that really make the history of a nation; but politicians think that they themselves make it, and historians fall into the same mistake.

Nevertheless, there are a great many wonderful and interesting things that are always happening on the surface of the earth, and that change it quite enough to make all the difference to our lives. So now we must leave alone five-sevenths of the earth's surface, which is covered with water. We must say no more about where the water has come from and what will happen to it, though we must remember that it is not fixed for all time; and we must make a study of the two-sevenths of the earth's surface that shows above the water. We are really creatures of the land, and we depend upon other creatures of the land; and as we breathe air, and cannot live under the water, it is the land that we can study best. So we shall keep to the land, but in so doing we must remember that it is only a fraction of the earth's surface, and a shifting fraction at that. But it is, on the whole, an increasing fraction. If we examine the surface of Mars, we find that Mars, too, has had oceans, and we even find the very interesting fact that the continents of Mars were pointed to the south, as those of the earth are. But the ocean-beds of Mars are now uncovered by water. The planet has become drier.

There can be no doubt that this process, which has gone farther on Mars, is also occuring on the earth. When we study, for instance, the continent of North America, we obtain proof that, long ages ago, the area of dry land corresponding to that continent was quite small. This gradual drying up of the surface of the earth, the geologists have proved, not only as regards North America, but as regards Europe, for there was a time when only the north of Scotland and Scandinavia were above the surface of the sea. This gradual loss of water, and the appearance of dry land, occurs upon a planet, such as the earth or Mars, or upon an even smaller body, such as the moon, in two distinct ways. In the first place, water always tends to

evaporate into the air, in the form of gaseous vapor, but the molecules of water, flying about in the air of a planet, have a tendency to fly completely away. This entirely depends on their rate of movement, and on the size of the planet. For each planet there is a particular rate of movement among the molecules of gases in its atmosphere, which the planet is able to control.

THE EARTH IS CONSTANTLY LOSING WATER THAT FLIES OFF INTO SPACE

The bigger the planet, the greater its attractive power, and the faster the rate of movement which it can control. But when the molecules of water or any other gas exceed this rate, they are liable to escape into space, never to return. This process goes on constantly, and is one of the most important facts in the history of a world. As we know, the ocean is always being lifted into the air by evaporation under the influence of the sun. Most of what is lifted up returns as rain, but a small quantity is lost for ever. This has to be taken into account when we say that, owing to the attraction between free hydrogen and oxygen to make water, the amount of water on a planet increases. This is probably true, but the planet does not keep all that is made.

Now, there is a second way in which the surface of a world, such as our earth, or Mars, or the moon, becomes dry, and that is by loss of water into its interior. As long as a planet is molten, there are no breaks in its surface, but as it cools and shrinks, cracks and wrinkles appear upon it, and so there is the loss of water which trickles through from its surface into its interior.

If these arguments be true, we should expect to find illustrations of them in the cases of the earth, and Mars, and the moon. The smaller a world is, the sooner it must lose its seas, since it has less power of gravitation by which to hold on to the vapor in its atmosphere.

WORLDS WITHOUT WATER ARE WORLDS WITHOUT LIFE

Now, the earth is bigger than Mars, and Mars is bigger than the moon; we should expect, therefore, to find exactly what we do find. On the earth, the sea-basins are still filled with water, though the level of that water is slowly falling; on Mars, the ocean-beds are only just moist enough to nourish plant life; and on the moon, they are quite dry, and contain nothing at all. It is a very significant fact, which strongly supports these new discoveries, that the level of the inland seas of the earth is falling—for instance, the Caspian Sea, the Dead Sea, and the Great Salt Lake. Now, the level of the first two is below the level of the ocean, showing how they have been slowly emptied since they were left behind by the retreating ocean. That such is their history, we know when we see forms of life found in the ocean still present in the Caspian Sea. In the cases of both the Caspian Sea and the Great Salt Lake in Utah, we know with some degree of preciseness the rate at which they are falling.

Now, all this has a tremendous meaning, and is of supreme interest and importance to those who spend their lives in studying these matters, and who, until only a very few years ago, have not been able to understand the history of the earth between the time when it was first formed and our own. It is the wide study of the earth as a whole, especially when compared with the moon and Mars, that is teaching us these remarkable lessons. We owe them mainly to Professor Lowell, of the Lowell Observatory in Arizona.

THE DRYING UP OF THE WORLD AND WHAT IT MEANS FOR MAN

The loss of water from the surface applies not merely to the oceans, but to what we call the dry land. Now, we have already learned that all life is lived in water, and we shall be prepared to understand that the loss of water from the earth, until at last the ocean-bed becomes dry land, must be a serious matter. After all, when the surface of the ocean falls, there is nothing to record that deeply affects life. But when water leaves the dry land, the most glorious forests, the most splendid fields of waving grass, must become deserts.

Now, it seems quite plain that the existing deserts of the earth mark the beginnings of this drying-up process, and its most serious consequences. Deserts are terrible places. Those who know them tell us that not until we know them for ourselves can we realize what the lack of water really means. One of the great desert belts of the earth includes the deserts of Central Asia, Arabia, the Sahara, and Arizona in America.

Those who travel there begin to realize what water is worth for life. Now, it is a very astonishing fact that we find definite evidence of the drying up which made these deserts. In Arizona there is a mighty forest which has been all turned to stone, since it lived millions of years ago. When that forest grew there was water; there is no water there now, or almost none, and life is no longer possible, except to a small extent.

How lands that were once fruitful have become lifeless deserts

There are also records in our own half of the world, as, for instance, in North Africa and in Palestine, of the same drying-up process. It seems that in both these cases the slow making of the desert, and its creeping over what was once the habitable earth, has gone on quickly enough for even the brief period of history to record. On the south coast of the Mediterranean Sea, practically at the edge of the Sahara Desert, we find the remains of mighty aqueducts which carried water to Carthage. The size of these ruins teaches us what has happened. The streams that to-day exist in that neighborhood could not begin to fill these aqueducts. The land is drying up, just as Palestine, which is now largely a desert, must have dried up since early Old Testament times.

If we turn to the case of our neighbor Mars, we should expect to find that the extent of the deserts there is greater, and this we do find. It is only the sea-bottoms that still hold vegetation. Five-sevenths of the surface of our earth is ocean; five-eighths of the surface of Mars is now a dry desert. The very name of Mars now has a new meaning for us. The planet was named after the god of war, and therefore of blood, because it has a red color.

The forests that make for life and the deserts that bring death

This red color is the color of the desert. When the deserts of the earth are looked down upon from a mountain peak, they show just the same tint as the deserts of Mars do when looked at through our telescopes. Like our own deserts, they change scarcely at all during the seasons.

If we grasp the tremendous meaning of the difference between a desert and a forest, we shall find a new interest in geography. In other parts of this book we learn something of the work of water, and of the meaning of the green leaf. The desert is where there is no water, and therefore no green leaf, except at the little spots here and there that are called oases. We have to think of the desert as dead. The forest, on the other hand, is not only alive, but the source of more life. Its green leaves are making animal life possible, for they are providing the food which animal life requires. The trees of the forest are purifying the air, splitting up carbon dioxide, and sending back pure oxygen to it. They are changing the soil and enriching it in a thousand ways, and all these ways are making for life. This is true even if we think of the remains of the trees as turning into coal, and serving the life of creatures, such as ourselves, that come into being ages afterwards.

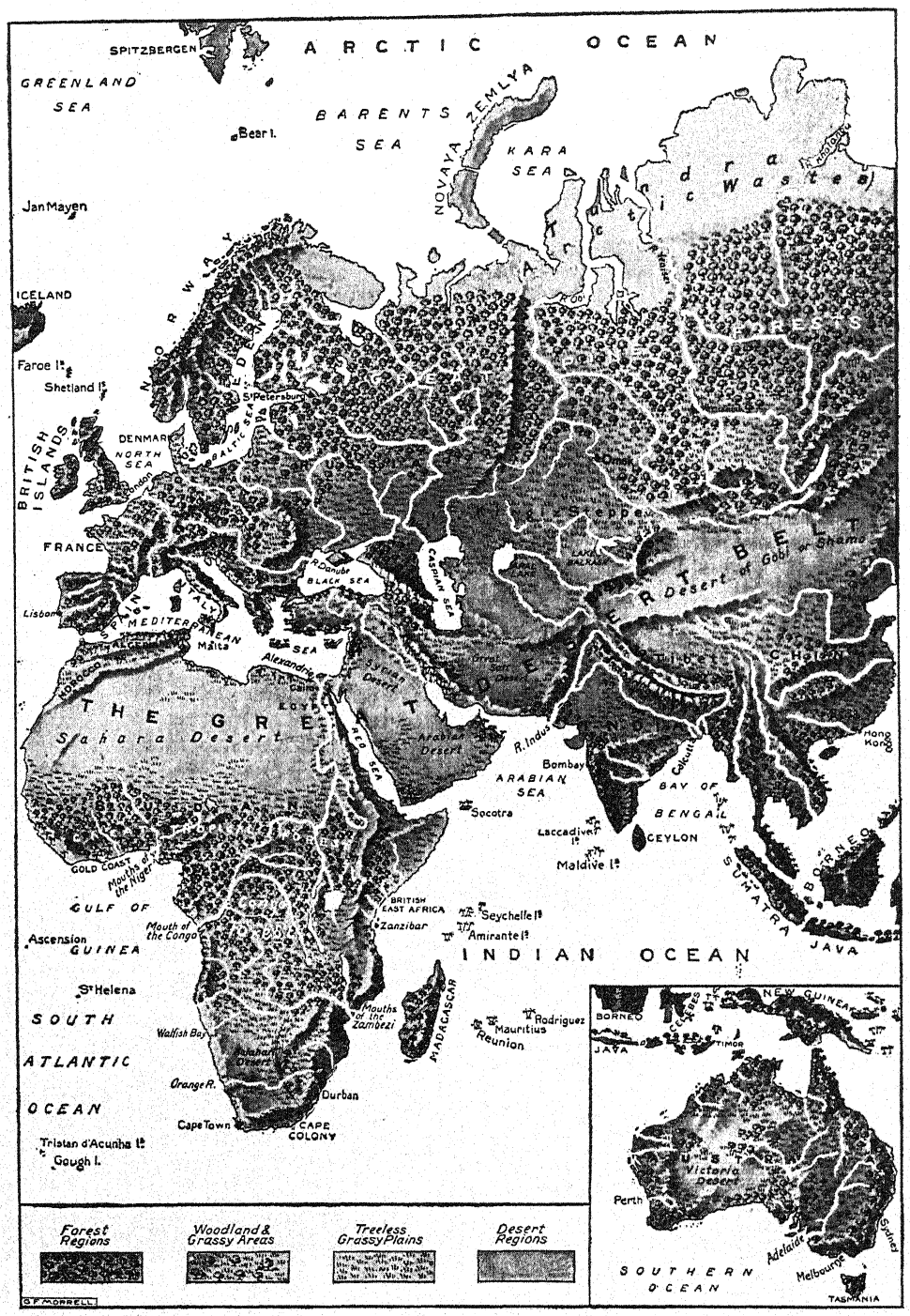
Now, the great continent of Africa, for which our English cousins are so largely responsible, and which their explorers, mainly, have discovered, supplies the world at the present day with the most tremendous instance possible of the meaning of desert and forest, and of the contrast between them. This is a point of deep importance both for the present and for the distant future.

The great desert and the great forest of darkest Africa

When we look at the great body of Africa, two tremendous features must strike our eye, for it furnishes us, on a gigantic scale, and in the most striking possible way, with an illustration of the two extremes that the land of our globe still furnishes. The great mass of the northern part of Africa, we know, is occupied by the desert which is called the Sahara. To the south of this, on the other hand, there is a mighty forest, which may be called the Congo forest. Right in the middle of Africa, closely corresponding to this forest, is a great river, which is called the Congo.

The basin of the Congo River corresponds to the Congo forest. The area of green extends a little farther north, and is helped by other rivers, such as the Niger, to some extent. The names of the rivers matter nothing. The point is that here is water, and here, therefore, are green leaves. It is of little consequence what color we give to this part of Africa in our maps. A map made by someone who thought of Africa as

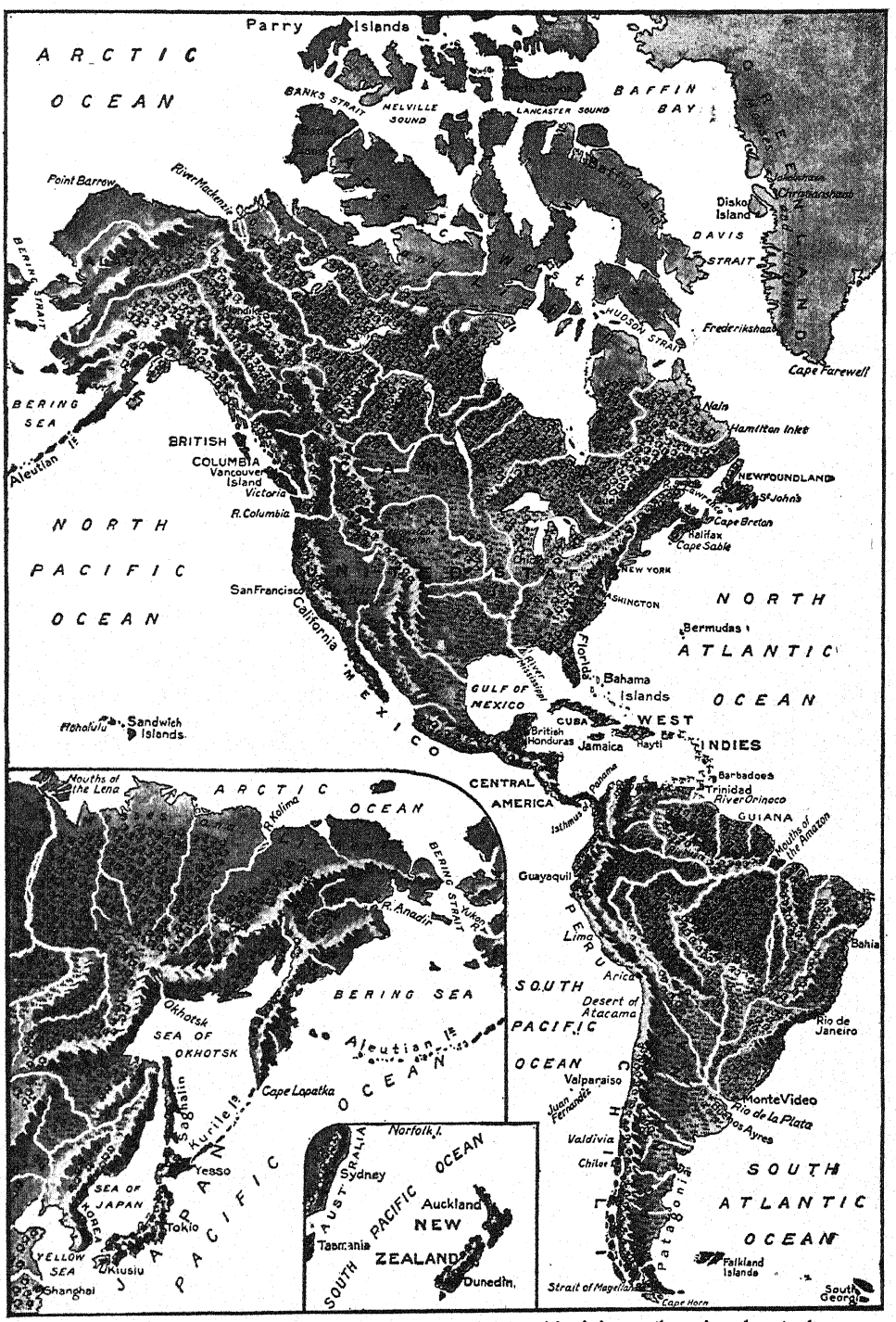
FORESTS AND DESERTS OF THE OLD WORLD



We all know that the moon has no water on its surface, in other words, that it has dried up. But not many people are aware that our own earth is also drying up, and that the deserts are spreading. In this map of the Old World we can see where the forests, the woodlands, and the grassy plains are; and we see also the great desert belt stretching across Africa and Asia. Inland waters like the Caspian Sea are becoming shallower as the years go by, and in the desert of Gobi, in Central Asia, a great lake called Lob-nor has dried up within the last century or two. The great Swedish explorer Dr. Sven Hedin found in this desert remains of great cities and trade routes, proving that a few hundred years ago it was a flourishing, fertile country.

The photograph of the petrified forest on page 3125 is by Messrs. Underwood & Underwood, London.

FORESTS AND PRAIRIES OF THE NEW WORLD



In the New World the same process of drying up is going on, and in Arizona there is a desert where once was a flourishing forest. We can see in this map the forests and grass plains of America, which are fast disappearing as population increases. The wholesale removal of forests is a disastrous thing for a country. The reckless destruction of protecting pine forests in the French Alps last century, for instance, led to the steep mountain-sides being washed bare of soil, and, as a result, in thirty years the population decreased by over 25,000. The great treeless plains of North America are called prairies, meaning "meadows." In South America they are called pampas, meaning "plains," and in Europe steppes, which is Russian for "heaths."

part of a living, changing world would have this great area painted *green*, and the still greater desert to the north of it would be painted *brown*.

Now we know what the brown area stands for—desert, dryness, death. We know something of what the green area stands for—moisture, life present, and life to come. Now, this particular green area is of more interest, really, than any other on the face of the earth, and that for a number of reasons, which we shall now begin to see.

THE FOREST THAT IS BEING DESTROYED FOR RUBBER THAT NO MAN CAN MAKE

It is interesting for its gigantic size and for its near neighborhood to the other possible extreme—that great desert. It is interesting for its immense wealth of many kinds; and it is especially interesting because certain things are happening there which it is in the power of man to control.

There is a substance called rubber, which has so many valuable uses that one cannot name half of them; and there is nothing else in the world that will take its place for these purposes. It is a product of a plant; indeed, it is made by the green leaf. At present chemists seem to be unable to make rubber artificially out of the elements which compose it. It is scarcely possible to name a more valuable or useful discovery than that would be—the making of artificial rubber.

Meanwhile, rubber is demanded, and the Congo forest has to supply it, as it supplies many other things too. This means that the people whom we call civilized men, such as ourselves, are making inroads into this forest on all sides, and this has very serious consequences. One is, that we are not taking care of the green vegetable life, which is really so priceless. Whenever we want to make a clearing, we just do so. This process is steadily going on, and more rapidly every year. We are thinking merely of the present moment, and are absolutely careless of the future and its needs.

HOW THE LOWER RACES OF MEN ARE BEING DESTROYED BY CIVILIZATION

Now, there are very special reasons for bitterly regretting what is going on in the Congo forest, and however comfortably we ride on rubber tires on our motor-car, or cycle, we ought to know the price that is being paid for them. There are certain kinds of life, nourished and sustained by the leaves of this great forest, which are not to be found anywhere else in the world, and which are immensely interesting. In the first place, there are several kinds of human life which foolish and brutal men may despise, but which wise men and wise children will understand to be precious, if only because of what they teach us about mankind in general.

Unfortunately, all over the world, what is called the "advance of civilization" is leading, as in the mighty Congo forest, to the slow but apparently quite certain destruction of all the humbler forms of human life. It is not merely in the Congo forest that this is occuring. In the case of the primitive inhabitants of Tasmania, and in other cases, the process has been finished, and these races no longer exist. As things are going at present, all over the world, it is probable that about a century will see the end of all the lower races of men.

THE STORY OF THE GORILLA WHICH MEN ONCE THOUGHT WAS A FAIRY TALE

Even if we admit that they are lower than we are—and that is true in some ways—yet they are deeply interesting, and have many lessons to teach us. Once they are actually wiped out of existence, the possibility of learning those lessons is, of course, gone for ever and ever.

Now, in the Congo forest, which we are to study specially, because it contains in itself all the lessons that we should learn, there are not only lower races of men, which are being destroyed just as the trees themselves are being destroyed, but there are also two kinds of monkeys which we do not find anywhere else, and which are more interesting than words can say. It is really only quite lately that we have known of their existence, and we still know very little about them. They are called the chimpanzee and the gorilla, and we see their pictures on page 627. It is not many years since the death of the great traveler, Du Chaillu, who rediscovered the gorilla, and whose story of adventure nearly everyone believed to be a made-up fairy tale for many years after his return from Africa. Now, though our knowledge of these creatures is so recent, and though no limit can be placed to what they might teach us, they are rapidly disappearing. The best authority on the subject believes

that the whole Congo forest cannot contain more than ten thousand gorillas, and there are none anywhere else in the world. There are probably not more than a hundred thousand chimpanzees. Now, these numbers may not sound small, but really they are very small indeed.

THE MAN-LIKE MONKEYS NOW DISAPPEARING FOR EVER FROM THE EARTH

Think of a little American country town with a population of ten thousand, and imagine that this was the whole human population of the globe; then imagine those ten thousand gorillas scattered in an immense area, which would hold the whole of Alabama many times over, and depending for their lives upon the existence of a forest, which was daily being destroyed. That is what is happening to the gorilla, and to the chimpanzee in the Congo forest now. As things are going at present, only a generation or two will see them both extinct for ever. All this matters nothing at all to many of the people who rule the world at present. They have never seen a gorilla, and never want to, unless they can make money out of it. But, to students of Nature and of human life, it matters very greatly that these marvelous creatures should be on the point of disappearing for ever from the surface of the earth, though mankind has only just become aware of their existence.

The gorilla and the chimpanzee possess hundreds of features in their bodies which are possessed by no other creature on the face of the earth, and no other creature that ever existed, except man. There are several diseases and disorders to which we are subject which no other creatures in the world suffer from, except these two, and the two other kinds of man-like apes, the gibbon and the orang. By studying these creatures we have lately learned some facts about human disease which are worth all the rubber in the world, all the rubber that ever was, or will be.

THE CRY FOR RUBBER WHICH DESTROYS FORESTS AND BRINGS HAVOC TO MEN

At the present moment our blind and wasteful ways are working havoc on almost every part of the earth, and nowhere more disastrously than in this mighty forest. We must have rubber for our tires, we must have it quickly and cheaply, and as long as the supply lasts for us, we do not care what happens next; we do not care that we are interfering with the future supply of rubber, that things too horrible to mention are happening to the unfortunate human beings who are the children of this forest, and that the man-like apes of marvelous kinds, to be found nowhere else on the surface of the earth, are being rapidly wiped out; and our ears will be deaf when, in some time to come, men will look back upon us and marvel that there ever could have existed human beings so selfish, so wasteful, so careless of knowledge and life.

Quite lately, in our own country, the people and the politicians have begun to learn what the men of science have been saying for many years past. It is that part of our duty to the world, and especially to our children and to theirs, is to plant trees. An old rule used to be that whenever a man cut down a tree, he must, at any rate, plant a new one to make up for it. They have forgotten that good rule in England. In America we never observed it, and thousands of acres of glorious forest, hitherto untouched by any hand but Nature's, have been cut down at an alarming rate.

THE TREE THAT WILL GROW WHILE THE GROWER SLEEPS

Men do not understand that all human life depends upon the green leaf, and that to cut down trees is to hack at the rope by which we are hanging. But the time is certainly coming when we shall be wiser. Sir Walter Scott, in a famous novel, "The Heart of Midlothian," quotes the dying words of an old Highland laird, or landowner, to his son: "Jock, when ye hae naething else to do, ye may be aye sticking in a tree; it will be growing, Jock, when ye're sleeping." It is strictly true that the man who makes two blades of grass grow where one grew before is serving mankind, and so when we see the rather long word afforestation, we must remember that it means making forests, and turning waste and bare places into the homes of life of every kind. And just as it was said of some destroyers, "They made a desert and called it peace," so it shall be said of those who help Nature in her great work, "The wilderness and the solitary place shall be glad for them; and the desert shall rejoice, and blossom as the rose."

THE NEXT PART OF THIS BEGINS ON PAGE 3249.

THE MOST FASCINATING QUEEN IN HISTORY



This is a picture of Mary Stuart, Queen of Scots, who is said to have been so beautiful and so wholly charming that no man could long resist her fascination. She was crowned when scarcely a year old and married Francis II, the young dauphin of France, when she was fifteen. Upon the death of the dauphin she became the wife of her cousin, Lord Darnley. Despite her beauty and winning ways the young queen's reign upon the throne of Scotland was full of troubles, which finally ended in her tragic death at the hands of Queen Elizabeth of England. In the background of the picture we catch a glimpse of the beautiful turrets of Holyrood Castle, where the rooms that were the apartments of Queen Mary may still be seen.



The English carrying the sacred standard at Northallerton where the Scots were defeated.

KINGS & QUEENS OF SCOTLAND

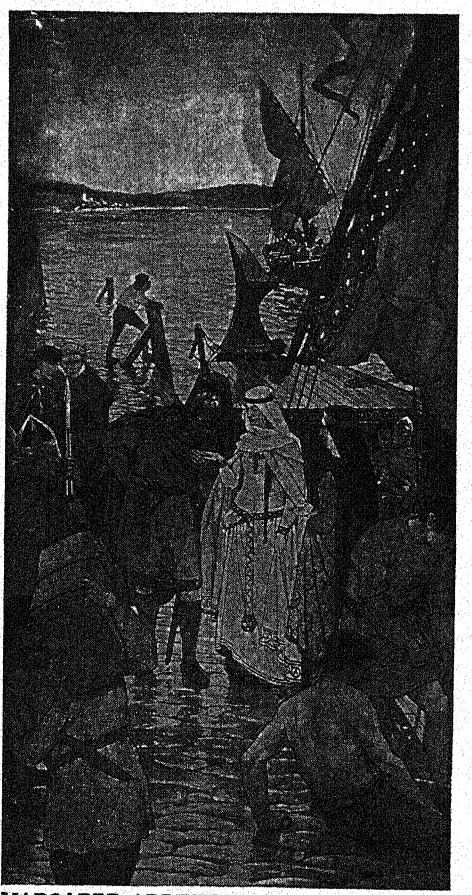
CONTINUED FROM 3054

THE people of what we now call the United Kingdom of Great Britain and Ireland have built up the great British Empire. But it was not so very long ago that all the "three kingdoms" of England, Scotland, and Ireland became joined together. For many centuries England and Scotland were two separate kingdoms, with separate kings. We have read about the great kings and queens who ruled over England, or over England and Scotland together; but here we read of the kings and queens who ruled in Scotland only.

In ancient days, about half of the lowlands of what we call Scotland to-day, the part that lies between the Forth and the Tweed, was a part of the kingdom of Northumbria. The rest was divided into the kingdom of the Picts and the kingdom of the Scots. Then a time came when a King of the Scots, named Kenneth M'Alpin, was chosen by the Picts for their king too. Kenneth and his successors were still called Kings of the Scots, or of Scot-land. Afterwards the land between the Forth and the Tweed was taken from a King of England by a King of Scotland, and then that district also became part of Scotland. We know very little about Scotland's kings till we come to Duncan, about the time when Canute, King of England, died. Duncan was slain by a powerful chief named Macbeth, who made himself king, and some of the stories of how he, urged on by his wife, killed Duncan and usurped the throne have been woven together into the wonderful play of "Macbeth" which Shakespeare wrote. But another story says that Macbeth had a better right to be king than Duncan, and killed him in fair fight.

However that may be, the first King of Scots of whom we know much was the son of Duncan, who won back the throne by slaying Macbeth; this was Malcolm called Canmore, which means "Big-head," from whom all the Kings of Scotland, and of England too, after King Stephen, were descended, because King Henry I. of England married Malcolm Canmore's daughter. Now, this Malcolm with the big head wedded Margaret, the sister of Edgar the Atheling, who was the true heir of Edward the Confessor; and that is why the blood of Alfred the Great flowed in the veins of his daughter, and of the children of Henry I., and of their descendants, right down to the present King George V.

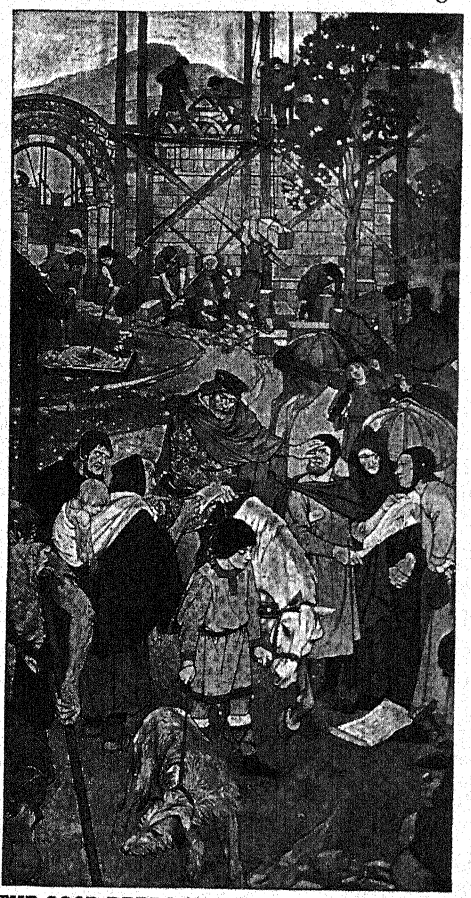
Malcolm Big-head was a stout warrior, and he was ill-pleased that William the Norman had seized the crown of England; for he would have liked to see his own wife's brother, Edgar, on the English throne. Therefore, Malcolm fought battles against both William the Conqueror and his son William Rufus, in one of which he was slain. He was a wise and brave king, and he had great love and reverence for his learned wife Margaret, who was held to be a saint.



MARGARET ARRIVING IN SCOTLAND IN 1066

When Malcolm was dead, there were evil days, for in accordance with an ancient Celtic custom, his brothers claimed the throne. But after a time Malcolm's son Edgar became king, and then another son, Alexander I., and then a third, King David I.; and all these three ruled wisely. But of them David was the most famous, for he made his kingdom strong. Moreover, he was a pious man, who built many fair churches and gave much land to the Church, for which reason he was reputed to be a saint like his mother Margaret.

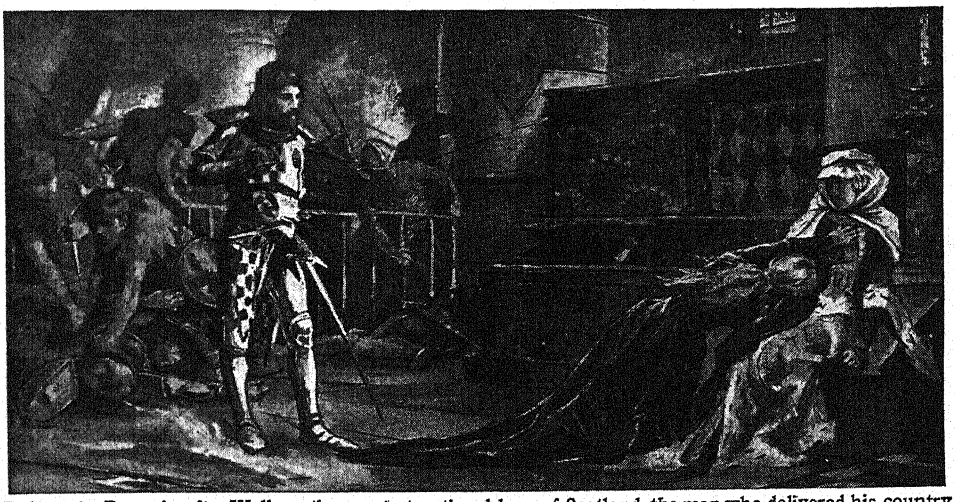
One of his descendants said that he had been "a sore saint for the crown," since he had made the Kings of Scotland poor that he might make the Church rich. King David was defeated in a great battle in England at a place called Northallerton, which is called the Battle of the Standard, because the English fought under a standard which was counted sacred. The battle was fought



THE GOOD DEEDS OF KING DAVID THE FIRST

for this reason. In those days the King of England was also Duke of Normandy, and so he was both a French baron and an English king. Just in the same way the King of Scotland held earldoms in England, and was an English baron, though the kingdom of Scotland was not under the King of England. David fought as an English baron defending his liege-queen Maud against Stephen, who had usurped the throne. Although he was defeated and had to make peace

THE KING WHO SET SCOTLAND FREE



Robert the Bruce is, after Wallace, the greatest national hero of Scotland, the man who delivered his country from the English yoke. But at first the fortunes of war went against him. After being crowned at Scone, with a small coronet, because the Scottish crown had been carried off to England by Edward I., Bruce was defeated at Methven, in Perthshire. He had to flee, and his wife and daughter were captured by the English.



Bruce drove the English out of Scotland and then set himself to build up his kingdom, so that he won the name of "the good King Robert." But the hardships of early years brought on a painful disease, from which he died in 1329. His last public act was to confer a charter upon Edinburgh, as shown in this picture.

The lower pictures on this page and on 3139, and those on pages 3134 and 3137, are reproduced, by permission, from the frescoes by William Hole, R.S.A., in the Scottish National Portrait Gallery, Edinburgh; the upper picture on page 3139 is by J. Faed, R.S.A.

with Stephen, he got nearly as much for Scotland as if he had won, because Stephen wanted to make sure that he would not invade England again during the civil war for the English crown.

After David, came a king who was called William the Lion, partly for his courage and partly because he bore on his shield a lion rampant—that is, a lion standing as shown on page 3133. Ever since then the lion rampant has been in the Royal Arms of Scotland; and now we see it in one quarter of the Royal Standard of the United Kingdom.

William made war on the English king, too; but one day when there was a thick mist he was riding with a small party of knights when he met a very much larger party, who turned out to be English. However, the Scots charged the English, but, after a hard fight, William and all his followers, except those who were killed, were forced to give in and were taken prisoners.

How Richard Lion-Heart Freed William the Lion

Then the King of England, Henry II., would not set brave William the Lion free till he and the Scottish people had agreed that he should do homage for Scotland itself as well as for the earldoms in England. So for a time Scotland was subject to England. But fifteen years later, Richard Cœur-de-Lion put an end to the agreement, and after that, just as before, the Scots kings did not pay homage for Scotland.

For a hundred years after Richard restored the independence of Scotland, there was peace between the two countries. There is nothing more that need be told about William the Lion; and of his son Alexander II. it need only be said that he was a wise man and a strong ruler, and of such high honor that the English king, Henry III. when going to France, trusted to him to see that the northern part of England should be kept in order; but he would have been afraid a less honorable man would try to foster disorder.

After Alexander II. came Alexander III., who showed himself wise and prudent while yet a boy—for he was only eight years old when he began to reign—and he ruled for nearly forty years. And in those days Scotland prospered, and the king was greatly loved and honored. Of the things that he did, the most famous befell while he was yet a very young man. For King Hakon of Norway claimed that he was lord both of the islands round Scotland and of some part of the mainland, and he led a great force of soldiers to extend his dominion there.

How the Thistle Saved Scotland and Was Made the National Emblem

However, King Alexander met the Norwegian king hard by the seashore at a place called Largs, and overthrew him utterly, so that King Hakon had to give up all his claims, and thenceforth the islands owned the King of Scots for their sovereign. And the story runs that it was at this time that the Scots took the thistle with its prickly leaves for their national emblem, because the Norsemen tried to make a night attack on the Scots army, but one of them, being barefoot, trod on a thistle and cried out, whereby the Scots took the alarm and stood to their arms, and, the surprise failing, the Norsemen were driven into the sea.

Alexander III. was killed through his horse stumbling and throwing him over a precipice, and his heir was his little grandchild Margaret, the daughter of Erik, King of Norway. Now, after a time, this little girl, who was called the Maid of Norway, set sail for Scotland that she might be crowned queen; but she came no farther than the islands of Orkney in the far north, where, being very ill, she was taken ashore to die. And thereafter came trouble, for, as we read on page 770, many barons came forward to say that one or another was now the heir to the Scottish throne, and out of this turmoil King Edward I. of England made his own profit. And how he made himself master of Scotland, and how time after time the Scots rose up against the English rule, we need not go into here, as it is all explained elsewhere in the book.

The Brave King Robert Who Feared No Man and Always Helped the Weak

Near the end of Edward's life, Robert Bruce claimed the Scottish crown for himself, and renewed the great fight for Scottish independence. Now, this great King Robert began with a deed which was evil enough; for, having resolved to claim the crown, he met one of the great barons, who was called the Red Comyn, in a church in the town of

JAMES III. PRESENTED TO THE NOBLES



When James II. was killed at Roxburgh, the Scottish nobles lost heart, but James's widow took the little king, James III., to Roxburgh, and so inspired the nobles that they pressed the English and made them surrender.

Dumfries; and then the twain quarreled, and Bruce slew Comyn before the altar. But from that time forth Robert showed himself always a mirror of true knighthood, for he was not only a very skilful warrior whom none could match in single combat, and a brave man who feared neither dangers nor difficulties, and a great and clever general who could lead small forces to victory against large armies; but he was loyal, generous, and true, tender to the weak, modest and gracious.

Many a fine tale is told of Bruce's prowess—how at one time three foemen set upon him at once, but he slew them all three; and how at another time he guarded the passage of a ford single-handed against a band of mounted men, because so long as they could only come at him one at a time he thrust them down one after the other, they not being able to cross the stream save at the one spot where he stood with his spear. As for the story of Bruce and the spider which taught him the lesson of perseverance in spite of defeat, we read that on page 2509.

THE LONG STRUGGLE FOR FREEDOM THAT ENDED IN VICTORY FOR SCOTLAND

King Robert had a hard task in setting his country free from the rule of a nation so much larger and wealthier than his own as was England, and it was well for him that for seven years King Edward II. of England was quarreling with his barons, so that the full strength of England was never brought against Scotland. And in those years Bruce won back fortress after fortress and town after town from the hands of the English, till Stirling alone was left in their hands. Then at last King Edward marched with a mighty army to save Stirling; but King Robert met him at the field of Bannockburn, and utterly overthrew him. And after that for many a year, while Edward and his barons went on quarreling, King Robert sent armies into England to harry the country. After the death of Edward II. a treaty was made in which the English acknowledged Scottish independence.

For twenty years King Robert had striven for the freedom of his country, which was won at last. But the long strife had given him no time and no chance to carry out his heart's desire of going on crusade to the Holy Land to purge his soul for that wild deed of his youth, the slaying of the Red Comyn under the roof of God's house. And now he was dying of a disease which came of the terrible hardships he had endured. Therefore, before he died, he prayed the most trusty of his knights, Lord James Douglas, to go in his place, bearing with him to the holy sepulchre the heart from his body placed in a casket.

HOW BRUCE'S HEART SET OUT FOR THE HOLY LAND BUT WAS BROUGHT BACK

Now, when Lord James came to Spain, on his way to the Holy Land, he found the Christians there hard pressed by the Saracens; therefore he was willing to fight on their behalf. Then in a great battle, when it seemed that the Saracens would gain the day unless they were stayed by some deed of desperate valor, Douglas drew forth the Bruce's heart, and crying, "Go thou before, as always, and Douglas follows!" he hurled the casket into the forces of Saracens, and drove his way through them till he reached it, and there was slain. But by that charge the Saracens were routed, and a knight named Sir Simon, called Lock-heart ever after, found the dead Douglas and the Bruce's heart, and bore it home, deeming that the dead Bruce had now done full service in the war against the infidels. And the heart was buried under the high altar in Melrose Abbey.

Of David II., the son of King Robert, we need not tell; and after him came his sister's son Robert, the High Steward of Scotland, who began the line of the Stewart kings, whose name began to be spelled Stuart two hundred years afterwards. After Robert II. came Robert III., who changed his name from John to Robert for better luck, because both King John of England and King John Baliol of Scotland, and also King John of France, had been so luckless.

THE KING WHO CHANGED HIS NAME FOR LUCK BUT DIED OF A BROKEN HEART

Yet he was none the better for that, since his eldest son was murdered, and his second son, James, was caught on a voyage to France and held a prisoner by King Henry IV. of England—a blow which broke poor King Robert's heart, so that he died soon after. This young prince was the first of six Kings of Scotland, each of whom was named

BEFORE AND AFTER FLODDEN FIELD



No more disastrous event is found in Scottish history than Flodden Field, where James IV. was defeated and slain with the flower of his army. Before the king set out, an old man suddenly appeared in his presence and warned him against war with England. But the king took no notice, and the stranger disappeared.



Flodden was a terrible battle for both sides, for the victory of the English was nearly a defeat and their losses were heavy. When the news of disaster reached the Scottish capital, as shown in this picture, it caused intense dismay, but the authorities calmed the people, and prepared promptly and firmly to resist invasion.

James. Between James V. and James VI. came the most famous of all Scottish monarchs, Mary Queen of Scots; and after Queen Elizabeth died, James VI. became James I. of England, almost two hundred years after Robert III. died. Now, of all those seven, only one, the last, reached the age of fifty. Not one was grown up on succeeding to the throne, and only one was so much as twelve years old. So we can readily understand that the ruling of Scotland was anything but an easy task, when every reign but one commenced with a regency. There was so much disorder that it is hardly strange to learn that of the six kings two were murdered and two killed in battle.

King James I. of Scotland was held a prisoner in England for eighteen years after he became king in name. One remarkable thing about him is that he is one of the very few kings who have been poets. James was in England about the time of the great English poet Chaucer; and, having fallen in love with a lady whom he saw through his prison window, who afterwards became his wife, he wrote a beautiful poem called the "Kinges Quhair," which means the king's book.

THE GOOD POET-KING WHO LOST HIS LIFE THROUGH DOING HIS DUTY

He was a good poet and a good king too, as he proved when he was at last set free and allowed to go back to Scotland. For there he found the country in great disorder and full of lawlessness; and, ruling with a strong hand, he protected the weak and curbed the nobles. Yet to do this he needed money, and the Scots kings were poor; so that he had to tax the people, and there were many of them, as well as of the nobles, who were ill-content with his rule. And so it came about that Sir Robert Graham plotted against him and murdered him, as we read on page 257 in the story of the Golden Deed of Katharine Douglas, whom men called Kate Barlass.

James II., called "fiery-face," was killed by the bursting of a cannon when he was only twenty-nine. James III., even after he grew up, was but a feeble ruler, guided by favorites of lowly birth, a lover of art and of books, but unfitted to rule over a turbulent country, and over barons who would not brook being lorded over by men of no account or ability, merely because the king chose them for his friends. Therefore the barons rebelled, and routed the king's forces; and he, flying from the battle, was thrown from his horse and murdered.

THE BRAVE SCOTTISH KING WHO WAS SLAIN ON FLODDEN FIELD

Then James IV. ruled, being just old enough to act without a regent. He was brave and handsome, and was very popular; also he took care of his kingdom, and in particular he tried to make Scotland powerful by sea; and the country prospered. And although he aided the pretender to the English throne, who was called Perkin Warbeck, against Henry VII., yet afterwards he married Henry's eldest daughter, Margaret.

So it came about, later on, that when Henry VIII. had no descendants left, the great-grandson of Margaret, who was the King of Scotland, became the heir of the English throne, so that the crowns of England and Scotland were united. Yet James IV. brought woe upon Scotland at the end; for when King Henry VIII. went to war with France, King James led an army into England because of an old alliance between French and Scots. And in the great battle of Flodden, James was slain himself, and with him the best of the nobles and of the soldiery. And a very famous song of lamentation for that disaster was made in Scotland, which is called "The Flowers of the Forest." Then came James V., who was an infant. And when he grew up, he, like his ancestors, had great trouble with his nobles, and also with his uncle, King Henry VIII. of England, who tried his hardest to get him into his own power, though James would not trust him in any way.

THE NEWS OF DEFEAT AND DISASTER THAT CAME TO A DYING KING

At last James prepared an army to make a raid into England; but it was put utterly to rout at Solway Moss. But when the news was brought to him he was very ill; and soon after, as he lay dying, there came a messenger to say that a daughter had been born to him; for he had no son. But all he said was: "It came with a lass, and it will go with a lass," meaning that the crown

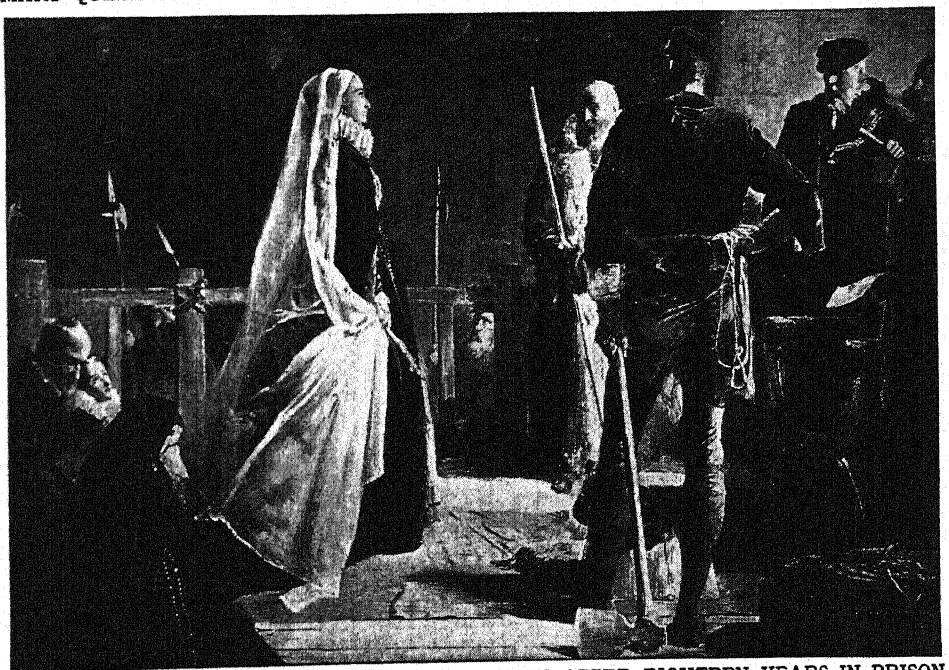
"THE LOVELY, HAPLESS SCOTTISH QUEEN"



THE SCOTTISH NOBLES COMPELLING MARY QUEEN OF SCOTS TO ABDICATE THE THRONE



MARY QUEEN OF SCOTS ESCAPING FROM HER IMPRISONMENT AT LOCH LEVEN CASTLE



MARY MOUNTING THE SCAFFOLD FOR EXECUTION AFTER EIGHTEEN YEARS IN PRISON

had come to the Stuarts through the daughter of Robert Bruce, and it would depart from them with his own daughter.

This daughter became very famous as Mary Queen of Scots. While she was still a tiny girl she was sent away to France, that she might be out of reach of the English; and she was brought up in the Court of France, and was wedded to the king's eldest son; so that when the king died she became Queen of France as well as of Scotland. In the meanwhile, her mother, Mary of Lorraine, ruled Scotland. But Mary was Queen of France for only one year, because her husband died, and she was a widow at the age of eighteen; and an orphan, too, for in that year her mother died also. Then the young queen resolved to return to Scotland and rule for herself.

Now, during these years there had been a great change in Scotland, for most of the people had become Protestants, and hated the Roman Catholic religion bitterly, thinking that it ought to be rooted out altogether. Moreover, this new Protestantism was very stern, and its preachers, of whom the most famous was John Knox, condemned all kinds of amusements and merry-making.

THE BEAUTIFUL YOUNG QUEEN OF SCOTS AND HER TRAGIC STORY

But Mary Queen of Scots was a very young woman, very beautiful and fascinating, who had been brought up at the French Court, which was exceedingly gay, and there she had been taught the Roman Catholic religion. She soon found herself giving offence to John Knox, and to all who thought with him, who would have forbidden the practice of her religion altogether. And then she was unwise enough to marry her cousin, Lord Darnley, a handsome young man, whom she very soon found to be both bad and foolish. And because she put much trust in David Rizzio, who was her secretary, Darnley had ill thoughts of her; and he, with several nobles, made a plot to slay Rizzio, and they murdered him before the queen's eyes.

After that she had a great hatred for her husband; and when he, too, was murdered, a year later, and she wedded the Earl of Bothwell, whom all believed to have done the deed, everyone believed that the murder had been done with her aid and goodwill. Then many of the nobles rose against her, and took her prisoner. They shut her up in the castle of Loch Leven, and made her give up the crown to her baby son, who became James VI. She escaped from Loch Leven, and her friends gathered to her; but the other party came against her, and routed her forces at Langside, near Glasgow; and she fled across the Solway into England, and called upon Queen Elizabeth to aid her.

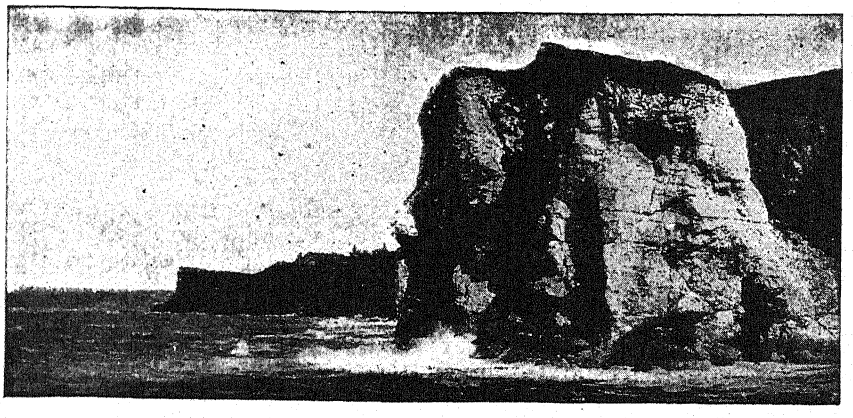
WHY ELIZABETH WAS AFRAID OF MARY AND HAD HER BEHEADED

Now, Elizabeth was the last daughter of Henry VIII., and Queen Mary would be the heir to the English throne if she died. Besides, the Roman Catholics thought that Elizabeth herself ought not to be queen, and some of them were anxious to try to make Mary queen in her stead. Therefore, Elizabeth would not let her go free. And yet, even if Mary had had a share in murdering Darnley, which had not been proved, Elizabeth had no right to put her to death, for she was not a subject of the English queen. For eighteen years Elizabeth kept Queen Mary a prisoner. There were many plots, in which the King of Spain had a hand, to destroy Elizabeth and set Mary on the throne; but we have no proof that Mary herself shared in them. But at last a young man named Babington made a plot, and a letter was shown which Mary was said to have written approving of the plot. Then the Queen of Scots was condemned to death for plotting treason against the Queen of England; and she was beheaded at the castle of Fotheringay, where she was held a prisoner.

THE KING OF SCOTLAND WHO BECAME KING OF ENGLAND

When Mary had been made to give up the crown, her son, who was only one year old, was proclaimed king as James VI. Regents ruled for him, but when he was just a boy he himself began to rule through favorites. But his favorites were not liked by the people, who were also angry with him because he tried to make them have bishops in their churches. When he became King of England he went to live in that country, and we read of his doings from that time in the part of this book that begins on page 1035.

THE NEXT MEN AND WOMEN BEGIN ON PAGE 3285.



WHY IS MEDICINE NASTY?

CONTINUED FROM 3047

IF we carefully study the laws of taste, what is liked or disliked, among the lower animals and among children, we find a general rule which should be a lesson for us all. The rule is not seen in the case of grown-up men and women, as their ideas of what is nice and what is nasty have been gradually altered by habit, and they think many things nice which no one could have persuaded them to touch when they were children.

Now, the rule we discover is that, in general, the natural, suitable, healthy foods of the creature we are studying are the things it likes. Everything else, as a rule, it finds nasty. No one would say, for instance, or at least no one who knows anything about it would say, that whiskey is a natural food for human beings, though many grown-up people take it as if it were a food, and not a medicine. But no child likes whiskey, and many medicines are not nearly so nasty as whiskey, which is really a medicine for sick people, and not a food for healthy people.

Our opinion of what is nice and what is nasty is the natural guide to what is a good food for us and what is not. It may sometimes lead us wrong to trust to this, because appetite is sometimes misleading, as sometimes it leads animals wrong; but we should be badly off without it, and it is a pity we do not use it more. A very interesting thing is that when the doctor wants to make his medicine less nasty, and as nice as possible, he adds some flavoring matter which has been got from a natural food of human beings. Fruit, such as oranges, is one of our natural foods, and the doctor uses nothing more often than tincture of orange-peel to make medicine less nasty.

WHY DO FLOWERS VARY IN COLOR?

We do not know in any clear way what originally produces the different colors in different flowers. We cannot alter the color of any particular flower to any great extent, even when we grow it from seed, unless, indeed, we blanch it by growing it in a soil that has no iron. The color of a particular flower is what it is through *heredity*—the general law that offspring resemble their parents.

This acts in a very remarkable way in some cases which are now being studied, especially in the color of sweat-peas, which vary a great deal, as we all know. It may seem to us that these variations are just haphazard—white and pink and purple, and so on, occuring by chance in flowers of the same plant. But it is not so. The different colors occur

in regular proportions, due to the way in which the laws of heredity work; and if we take seed from these flowers, and grow it, we find that these laws are still maintained in the color of the flowers of the next generation. We know, too, that the single cell from which every plant starts contains tiny living parts that determine what color of flowers it shall have, and what proportion of each kind of color is to be in these flowers.

WHERE DOES THE FOG GO WHEN IT CLEARS UP SUDDENLY?

The answer to this question is not fully understood, but we know quite well what happens in certain cases. For instance, a wind, warm or cold, may come in and drive the fog before it, exactly as the air of a room where several people have been smoking may be cleared by making a draught. Or sometimes a fog clears suddenly because the air becomes warmer, as may happen in various ways. A fog is only possible when the air is below a certain temperature, and if the sun, coming through clouds, or an inrush of warm air, raises the temperature above this point, the fog will suddenly disappear.

But electricity is also concerned in this question. We know that it is possible to disperse a fog artificially with great speed by means of electricity. This has been proved by an English scientist, Sir Oliver Lodge. Now, electrical changes constantly occur in the atmosphere. Indeed, we are beginning to learn that they are the principal causes of the weather; and I think it is very likely that sometimes when a fog suddenly disappears, as if by magic, it is because of some electrical change in the air, of the same kind as that produced by Sir Oliver Lodge's machine for dispersing fogs.

WHY ARE OUR VEINS BLUE WHEN OUR BLOOD IS RED?

The blood in the veins is certainly not blue, and there is no such thing as "blue blood"; but it is quite different from the bright red of the fresh blood that has come from the lungs and travels to the body through the arteries. We see the light reflected back to our eyes from this dark red blood through the walls of the vein, and it is these walls that give it its bluish tinge. If we have seen the dark, dull color of the blood as it runs in the veins, we shall easily understand that it needs only a little change of its color to make it a dull blue.

WHAT HAPPENS TO THE CARBON DIOXIDE THAT WE BREATHE OUT?

There is always a certain proportion of carbon dioxide in the air, even in the open air. The carbon dioxide we breathe out is added to this, which is indeed the product of the past breathing of countless millions of animals and of the burning of carbon in countless fires. The air, rich in carbon dioxide, that we breathe out does not stay by itself, so to say, but the various things composing it, including the carbon dioxide, gradually spread themselves out into and mix with the air around them.

This very important law is true of all mixtures of gases. Whenever different gases are put together, the molecules of the one gradually pass among the molecules of the other. This is called the diffusion of gases. So by means of diffusion the carbon dioxide that we breathe out is, before long, quite equally mixed with the rest of the air. As we know, it does not remain for ever in the air unchanged, for, wherever there is green vegetable life, some of the carbon dioxide of the air is decomposed, the carbon being taken into the plant and the oxygen left in the air to add itself to the free oxygen which is always present in the air.

So the carbon dioxide goes on a ceaseless round or cycle, in which animal and plant share and help one another.

WHAT IS A MIRAGE?

A mirage is an appearance, low down in the sky near the horizon, of something that is not there. It occurs especially in certain conditions of the air when it is very hot, and most of us have heard how it deceives travelers in the deserts of hot countries. Sometimes in deserts there are spots called oases, where there is water, and, since there is water, there are also green trees and shade. And we are told that sometimes travelers think they are coming to an oasis only a few miles away, where they can get water and shade; and then, as they travel on, it disappears. A great explorer once "discovered" and named a mountain which did not exist, but which he had seen as a vision, or mirage. So we apply the word mirage sometimes

to a thing that looks real and pleasant from a distance, but which, as we draw nearer to it, vanishes altogether. I am afraid we all see mirages of this kind at some time in our lives.

WHAT CAUSES THE MIRAGE?

The true mirage is not an appearance in the sky due to nothing at all, and it is not purely imagination on the part of those who see it. When the traveler sees an oasis in the desert, and it fades and deceives him, what he has seen is the image of a real oasis, much farther on, below the horizon. The light from the real oasis has been somehow reflected from a layer of air, and so the traveler sees it—as if there were a huge mirror in the sky placed at such an angle that it threw a view of the oasis to the traveler's eyes.

It must be that there are layers of air of very different temperatures, and therefore of very different density, and whenever light passes from one thing into another of different density, part of it does not go on, but is reflected. Appearances due to a similar cause are often seen at sea. A ship near the horizon may seem to have another ship, exactly like itself, perched upside down upon it, the masts of the one beginning where those of the other stop.

HOW DOES THE VOICE GET INTO THE GRAMOPHONE?

A gramophone is a special kind of phonograph, and the phonograph was invented by Edison. The two words are really the same, only the two parts of them are turned the other way. *Gram* or *graph* means "write," and *phone* means "sound." The voice, or whatever the sound is that the phonograph records, writes itself on a plate or a cylinder. What happens is that a small needle is shaken and made to write by the sound, being connected with a drum against which the sound-waves strike. When the instrument is played, the marks on the record are followed by a needle, much the same as that which made them, and the needle, being shaken as it follows the tracing, shakes another drum, and that shakes the air—or produces sound-waves—in exactly the same way as when the record was made.

If we look closely at one of these marvelous machines when it is being played, we can then see for ourselves the faint, irregular line on the record, the needle following it, and the drum to which the needle is fixed, and we shall hear the sound-waves made by the drum as the needle shakes it. People who study sound, especially the sound-waves of the various letters we use, photograph these records and enlarge the photographs, and so can study exactly the shape of the sound-waves that make a and e and the other vowels.

WHY DOES NOT THE MOON MAKE WAVES ON RIVERS AS WELL AS ON SEAS?

The moon does not exactly make the waves of the sea, but it draws the sea after it as the earth spins, and as the sea usually moves in waves, due to the wind, so the tides rise and fall in waves. This is a wise question, for we might think that the water of a river ought to behave as the water of the sea does, and there is no doubt that water everywhere, and every liquid surface, and even the solid crust of the earth, are affected by the moon.

But the sea is deep, and so there is enough water to be heaped up under the pull of the moon, and to make visible tides. The water of a river is very shallow in comparison with the sea, but near the mouth of most rivers, where they communicate freely with the sea, the great tidal stream of water flows up and down the river as the tide flows and ebbs; and so the influence of the tides can be seen in these tidal rivers, perhaps many miles up from the sea. Thus, the tides can be noticed in the Hudson in New York, and in such cases the moon does "make waves," or, rather, an inflow and outflow of water, in rivers.

WHY DO TELEGRAPH WIRES SEEM TO GO UP & DOWN WHEN WE ARE IN A TRAIN?

They seem to go up and down because they do go up and down! That is to say, the telegraph wires "hang," and are not straight like a piece of wood. We see this well from a train because it carries the eye along very quickly at the same level, so that even though the curve of the wires is not great, we can notice it. The earth is pulling on the wires, as it pulls on all matter everywhere. This is another way of saying that they have weight, and this makes them sag, or drop a little, between the telegraph posts. Metal wires are, of course, quite heavy, and they "give" under their own weight. But if you have flown a kite to any height,

you must have noticed the same thing even with a light material like rope or string. When the kite flies high, the string does not rise in a straight line from your hand to the kite, but curves in the air—always downwards under the influence of the earth's pull—or, as we say, by its own weight.

WHAT IS PAIN, AND WHY DOES IT HURT?

Not the wisest man can answer this question, but we know some things about it. We know that certain nerves run to the skin, and that when they are excited the result is pain—just as when the eye nerve is excited the result is sight. We know that when these nerves are damaged and cannot work, the skin cannot feel pain. Also, we know that when any other nerves are excited too intensely the result is painful. Loud music may be very pleasant, but there is a point beyond which it quite suddenly becomes painful. Similarly, a bright light may be beautiful and pleasant, but beyond a certain point it suddenly becomes painful.

No one, however, has any idea what happens in the nerve or in the nerve-cells when this change comes, though it has lately been thought that when a nerve is very highly excited it changes in shape. This, however, does not tell us in the least why pain should go with it. No one could explain what pain was to a person who had never felt it, except by causing him pain. Similarly, you cannot describe sight to a person born blind. Words cannot describe these things, except to people who know them by experience already.

WHY IS OUR SHADOW BIGGER THAN OURSELVES?

Our shadow is not always bigger than ourselves. It depends entirely on the height of the sun above the horizon. When the sun is high, our shadow is much shorter than we are; if the sun were right above us, in the part of the sky which is called the zenith, or highest point, then our shadow would be just a tiny mark round our feet. But the lower the sun falls, the more do its rays slant as they approach the ground, and so our bodies may throw shadows many feet in length. If we always think of light-rays as traveling *outwards* in straight lines in all directions—as you will easily understand if you consider a candle or a gas-jet—we shall see that the shadow of a thing will be bigger the farther away it is thrown. Sometimes we can notice this in the case of our own bodies. When the sun is low among the mountains, we may be standing on one peak or ridge and throw a shadow which does not strike the ground at our feet, but crosses a valley and strikes the side of another mountain. Such shadows may be enormous, and even terrifying. When the earth gets between the moon and the sun, it throws a shadow which we call an eclipse of the moon. This shadow falls upon the moon and darkens it to our view. You can test the rule about the size of shadows at any time with a pencil and a candle, or with your hand near the ground on a tablecloth in sunshine.

CAN WE SEE LIGHT AND DARKNESS ANYWHERE AT THE SAME TIME?

If we could stand on the moon, we should perhaps be able to do this, for the moon has nothing to scatter the sun's light, and so the shadow of night would have quite a sharp edge. But the earth has the atmosphere, which is always scattering and reflecting the light that passes through it, so that the advancing shadow never has quite a sharp edge. This is why we have twilight. The sun has set, it is below the horizon, and if there were no atmosphere we should be in total darkness the very moment the sun set; but the air reflects the light from above down upon us for a time, except in tropical regions.

Of course, the higher part of the air can see round the corner of the earth, so to speak. The sun's rays still fall upon it, though we are cut off from them; and it turns them to us so long as it gets any. Gradually, as the sun sinks lower, its rays strike higher and higher in the air above us, until at last they fail altogether, and twilight has passed into night. In some parts of the world, owing to the state of the air, the air reflects much less light downwards, and in those places we say that night falls very suddenly. But nowhere can we see the advancing shadow of night. How impressive it would be if we could!

WHY IS ICE SLIPPERY?

We say that a thing is slippery when its resistance to motion along its surface is very slight. This resistance, or friction, is a thing we rather dislike—especially in machinery; but we should

find things very inconvenient without it. Walking and running would be utterly impossible without friction, and even standing still would require the most perfect balancing. When we walk on ice, we get as much friction as possible from our boots. If we tried to walk on boots soled with ice, or covered with an even layer of oil, we could not walk at all, for there would be practically no friction to keep our feet where we planted them. The absence of friction in the case of ice depends upon its beautifully even, crystalline structure.

The molecules of water are held together very smoothly and evenly, and this is especially so if the ice formed when there were no currents in the water and no wind, so that its surface was very smooth when it became frozen. Various substances, like oil and wax and varnish, will give an extremely smooth surface even to things like wood, and so render them almost free from friction. When we skate, we use a metal surface as smooth as possible, both on the flat and on its two edges, and though there is no small amount of friction when the blade cuts a line in the ice, yet it is not enough to prevent us from sliding on the skate-edge for many yards at a time.

WHEN A LEAF IS PLUCKED FROM A TREE, DOES IT HURT THE TREE?

The word *hurt* may mean *injure*, or it may mean *pain*. The plucking of a leaf does not pain the tree, because a tree cannot feel anything that we should call pain. But when a living green leaf is plucked from a tree, the living cells where the break is made must feel something, only it is a very faint feeling; and, of course, we must not think that it is in the least like pain, or that it is possible to be cruel to a tree, as one might be cruel to a cat. When a dead leaf falls from a tree, the tree cannot feel anything, for a layer of something like cork has been formed at the base of the leaf, and so the leaf is really no longer part of the living tree.

If *hurt* means injure or harm, that is really another question. The leaf exists for the life of the tree; it serves to feed the tree; it breathes for the tree, and helps to remove from it the water which the roots have sucked up. Of course, a tree has many leaves, and so to pluck one cannot hurt the tree much; but if we were to strip all the leaves off a tree in the spring, we should soon find that that harmed the tree. But when the wind blows the leaves off a tree in autumn, the tree is not harmed, for it has already taken what it wants out of the leaves, and has no use for leaves until the next year.

WHY DOES NOT THE SUN DRAW UP THE SALT FROM THE SEA?

The different elements and compounds differ naturally and permanently from each other in the extent to which they are *volatile*, or fly-able. Some, such as the gaseous elements, and a liquid element like bromine, or a solid one like iodine, are very volatile; so are many compounds, such as water. They readily give themselves off as gases to the air if the conditions are at all favorable. But many other elements and compounds can only be volatilized, as we say, with extreme difficulty. Carbon, for instance, is one of the least volatile of all substances, yet under the tremendous heat of the electric arc-lamp, or in the hot stars, carbon can be made volatile.

The salts of the sea are among the least volatile of compounds. If heat enough were applied to make them volatile, they would probably decompose, or be broken up into their elements, first. So the sun can evaporate, or *make into vapor*, only those things, such as water, which turn readily into vapor. It cannot bring nearly enough heat to bear on the salt of the sea for this purpose; and if it did, as we have said, the salt would probably break up rather than evaporate as salt, and would give off its elements as gases.

WHAT IS A THUNDERBOLT?

We know that lightning often strikes houses and trees, and even people. With lightning goes thunder, and long ago it was supposed that something, a "bolt," was actually thrown from the sky during a thunderstorm, and struck such things as trees. The thing that men thought was thrown was called a "thunderbolt." In those days people thought that God threw thunderbolts and so destroyed those with whom He was angry. The Romans, too, taught that the thunderbolt was the bolt of Jove, or Jupiter, who was their chief god. But we know now that there is no such thing as a thunderbolt, and the damage that it was supposed to do, is really due to the passage of an electric current from the air to the

earth, which damages anything it passes through.

WHY DOES THE SUN MAKE THE WET SANDS STEAM AT THE SEASIDE?

I am sure, said the Wise Man, that the boy or girl who asked this question could answer it. I think so, partly because it is an easy question, but specially because anyone who carefully observes or notices things should be able in time to explain them. It is the very first thing in the study of the world, or of anything, to observe the facts carefully. Many people do not notice at all a thing like this, or, if they do, they forget about it. They cannot learn much until they learn to notice. The answer to this question is, that, when the sun comes out, it raises the temperature of the air so that it is able to hold more water in it, and it also raises the temperature of the sands and the cliffs and the water lying on them, so that the water passes into the air in the form of steam. This passage of water from air to earth, and back again, is always going on, but we seldom see it in this plain way.

WHY DOES IT RAIN SO MUCH IN SCOTLAND?

This is another of those very difficult questions about the weather which no one can fully answer yet. One of the great causes of rain is the existence of much water for the sun to draw up, and so any island is far more rainy than the interior of a continent, such as the Sahara Desert. That applies to the whole of the British Isles. But the rain that falls in the islands is principally brought from the greatest expanse of water near them, which is the Atlantic Ocean. So it is chiefly the "warm, wet western wind" that brings the rain. It deposits the rain most where it is most cooled, and as Scotland is farther north than England, it is colder; and so its climate condenses more rain than the climate of England does.

Scotland also has a very broken west coast, so that the water of the sea comes far up into the land, as in the case of the Clyde, round which there is more rain than anywhere else in Scotland or in England. The west coast of Ireland is very rainy, too, and I think that poor Ireland catches part of the rain which would otherwise fall on England. Scotland, again, is very hilly and mountainous, and we know that air is cooled in rising over hills, and so deposits much of its moisture as rain. Of course, the east coast of Scotland—for instance, such a county as Berwickshire, which is also rather flat—is far drier than the west, for when the west wind reaches it, it has already spent most of its moisture farther west. These are some reasons why Scotland is more rainy than England, but there may be more.

WHY DOES A PIN GROW HOT IF RUBBED AGAINST A STONE?

All rubbing, or friction, produces heat. If you had a really delicate thermometer, you could easily prove that paper and india-rubber and the air around them all grow hotter when you rub out something you have written. The motion that starts the rubbing is changed into the special kind of invisible motion called heat. In the case of a pin rubbed against a stone, we notice the heat effect of friction particularly well. This is, first, because the pin has a narrow edge and a sharp point, which is very much stopped by the uneven surface of the stone; and, second, because the pin is made of metal, and all metals are very good conductors of heat. So the heat runs up the pin very easily and quickly, just as it runs up a poker held in the fire, and that is why we feel it so distinctly.

WHY DOES NOT SNOW FREEZE UP FLOWERS?

Sometimes snow does freeze up flowers, but only when the earth itself has become very cold, so that the soil-water has been frozen. Even then, plants do not always die, by any means. Sometimes they seem merely to stop living, as it were, for a little, and then start again. But plants and flowers are protected against cold, if they are accustomed to live in cold places, by the fact that they produce heat within themselves.

We think, perhaps, that only warm-blooded creatures like ourselves produce heat, that a frog does not, and still less a plant. But every living thing breathes, all breathing is burning, and all burning produces heat. Therefore, every living thing produces heat and plants are no exception. In quite a number of cases now, men have succeeded in measuring the heat produced by plants, and they have shown that many plants always maintain themselves at a temperature hotter than that of the air around them. Plants vary widely in their power of

resisting cold. The vine will not stand the cold in which an Alpine plant thrives; but where plants do resist cold, it is because of their power to produce heat, and probably also a power of keeping water liquid inside their living cells, though it would freeze at the same temperature outside.

WHY INDIA-RUBBER RUBS OUT PENCIL AND A CERTAIN SORT RUBS OUT INK

When india-rubber rubs out pencil-marks on paper, or "ink-erazer" rubs out ink-marks on paper, or pumice-stone rubs out ink-stains on our skin, what happens is really the same in every case. It is the rubbing, or the friction, that actually rubs away the outer layers of the paper or the skin, and so removes anything that they may contain. Soft india-rubber rubs away only the surface-layer of paper, but that is enough for pencil-marks, which only deposit a thin layer of carbon on the surface of the paper. A harder rubber—or a knife-edge, which acts in exactly the same way—will rub off a thicker layer of paper, and so will remove ink-marks, which penetrate much more deeply into paper, being made by a liquid. Pumice-stone is hardest of all, and when we rub our fingers with it, it removes ink-stains, which are deeply absorbed by our outer skin, as india-rubber could never do.

WHY DOES NOT THE EARTH GET IN THE WAY OF OTHER WORLDS?

The earth is kept in its course by the sun's attraction, we know, and so are the other planets. As none of them can leave their own path, they do not get in each other's way. But if any other body came flying into the solar system, it and the earth or one of the other planets *would* get in each other's way. This does sometimes actually happen. Comets, which are in a sense separate worlds, though, of course, very small ones, sometimes fly into the solar system, attracted by the sun, and are carried out of their course by one or other of the planets.

Jupiter is the giant planet, and is farther away from the sun than the earth, so it is usually Jupiter and a comet that get in each other's way. Jupiter may have caught several comets in this fashion, or, if it has not actually caught them, it has altered their path, as your path is altered when someone gets in your way. It is very likely that the moon of Jupiter which was last discovered, and perhaps some of the others, were caught in this way. They were probably little independent worlds, until they ventured too near the giant planet, and were caught by him, and compelled to circle round him as all his moons now do. It is just possible that our moon was caught in this manner, because it got in the earth's way; but it is much more likely that the moon was once part of the earth.

WHY DOES WATER CRACKLE WHEN A RED-HOT POKER IS PUT IN IT?

The crackling noise is due to the bursting of little bubbles of something. A bubble is a closed envelope of fluid containing a gas of some kind. Usually this gas is compressed, and as it expands it stretches and makes thin the liquid envelope until it bursts. Then the gas escapes and expands very suddenly, and makes a little explosion, starting the waves in the air which we hear and call sound. It only remains, then, to find out what makes the bubbles in the water. A cold poker will not make them.

Therefore, it is not the iron of the poker, nor the shape of the poker, that makes them, but its heat. With everything else but its heat, the poker will not make bubbles. It is not difficult to see how the heat does this. It rapidly turns the water near it into gas, and this gaseous water, and also the air dissolved in the water, form bubbles of hot, compressed gas surrounded by an envelope of liquid water. These are quickly made and quickly broken, and in breaking they make the crackling noise that we hear.

WHAT MAKES THE NOISE WHEN A BAG BURSTS?

The noise of a bursting bag is due to the same cause as the crackling of a bubble or any other kind of explosion. A bag is really a kind of bubble, only the envelope containing the gas is not made of liquid, but of paper. Also, the gas is not under pressure, for it is not hot, and does not tend to expand and make the bag-bubble burst. So we apply the pressure from without, which comes to the same thing, by striking the bag between our hands, and so it bursts as a bubble bursts, and with the same result—the starting of the air-wave that we call sound. It is a noise, and not a musical note, because the air escapes irregularly, "anyhow," from the bag, and so starts

an irregular air-wave, and not a regular wave consisting of even vibrations at a fixed rate. If it were such a wave, we should hear a musical note The air escapes from the bag of bagpipes, and makes a more or less musical note because, as it passes out, it strikes something which vibrates regularly and so throws the air into regular waves.

WHAT MAKES THE SOUND IN THE ORGAN?

When the organist puts his finger on a key, he allows air to enter the pipe of the organ that corresponds to the key he touches. The air is thrown into vibration in the pipe, and this spreads in all directions through the air and makes the sound we hear. It is really a vibrating column of air that produces the sound, while in the piano, or the violin, it is a vibrating string.

So the organ is really a huge wind instrument, as the others are stringed instruments. The rate at which the column of air vibrates decides the note we hear, and depends on the length of the column, which, of course, depends on the length of the pipe. Thus, a pipe 32 feet long will hold a column of air that vibrates just half as fast as the column in a pipe 16 feet long, and the note of the longer pipe will be exactly an octave below the other It would not do if there were nothing but a plain pipe, because, of course, the air would simply rush through it with a hiss. At one end of the pipe there must be something to throw it into vibration, a "tongue," which may be made of various materials and shapes according to the particular *quality* of the note we want. But the *pitch* of the note is decided by the length of the pipe.

WHY SHOULD ANYTHING LIGHTER THAN WATER FLOAT?

It is a law of Nature that lighter things pass above heavier things—just as the dregs of a liquid fall to the bottom, being the heaviest part of it, and the scum rises to the top, being the lightest part of it. We may make a kind of explanation of this by saying that the attraction of the earth is greater for the heavier thing, and so it passes nearer to the earth; while the attraction of the earth is less for the lighter thing, which accordingly does not get so near to the earth. The law is the same for all liquids and for all gases. A lighter gas floats on a heavier gas, and a lighter liquid on a heavier liquid. Also we find that when anything floats in water, the weight of the volume of water which it pushes out of its place is equal to the weight of the floating thing. This is the most important law of floating. If the mass of water displaced by a thing is lighter than that thing, then it must sink; and if a thing floats, the amount of it under the water is such as to displace a quantity of water equal in weight to the whole thing.

WHAT DOES "EUREKA" MEAN?

This famous word means "I have found it," and the story goes that it was used by one of the greatest men of antiquity, Archimedes, who discovered the law named in the last question. The king's crown had been in the hands of the goldsmith, who was suspected of having replaced some of the gold by some other metal; and Archimedes was set the task of finding whether this was so. He did it by putting the crown into his bath and noticing how much the water rose; and he is said to have run out into the streets shouting "Eureka! Eureka!" And now, when we have found out something we have been searching for, we sometimes repeat his famous exclamation.

WHY DOES THE OUTSIDE OF A CUP CONTAINING ICE-CREAM GET WET?

When we put ice-cream in a cup, the cup becomes very cold. The air around it becomes cold, too. The reason is that the heat in the cup and in the air are pouring into the ice-cream, and what they lose it gains. Now, the air has in it a good deal of water-gas, or water-vapor; but when it is cooled this water-vapor cannot remain as vapor, but turns into liquid water, which gathers on the outside of the cup. The wet on the cup is therefore dew, and it forms on the cup just as dew would form on the cup if, without any ice-cream in it, you simply put it in the garden in the evening. The amount of water that air can hold becomes less the cooler the air is, and so, whenever air is cooled, some of the water in it will be deposited upon the surface which is cooling the air. The heat of the air round the cup passes into the ice-cream, and that, of course, is what melts it.

THE NEXT QUESTIONS ARE ON PAGE 3225.

CRIMSON-TOPPED WOODPECKERS AND OTHERS



YELLOW-BELLIED SAPSUCKER



WHITE-BREASTED NUTHATCH



DOWNY WOODPECKER



BROWN CREEPER



CROW BLACKBIRD

All of these except the crow blackbird live chiefly in the trees, to which they cling, going up or down with equal ease. The crow blackbird, or purple grackle, is twelve inches long, with a brilliantly colored head and neck

WHAT THIS STORY TELLS US

CANADA has many birds because, as yet, the population has not been great enough to destroy them. A few of those described below are found only in Canada, others live with us the entire year, though they may also be found elsewhere, but more are summer visitors, and spend the winters farther south. In this article you will find excellent descriptions of the birds, with interesting accounts of their habits. Dr. Hamilton has emphasized the fact that many of them are our good friends because of the millions of injurious insects they destroy, and thus save large quantities of grain and fruit for food. The colored plate is printed by special permission of the United States Department of Agriculture, Washington, D. C., for which the birds were drawn.

COMMON LAND BIRDS OF CANADA. I

"A LIGHT broke in upon my soul—
It was the carol of a bird;
It ceased—and then it came again,
The sweetest song ear ever heard."
—BYRON.

CONTINUED FROM 3068

In Canada we have many birds. In warmer sections of the country about two dozen are permanent residents, and a dozen or more are winter visitants. The great majority of our summer residents arrive from southern United States, the West Indies, and Central America, in spring and early summer, and leave us for those warm regions when cold nights foretell the approach of winter.

THE RUFFED GROUSE, THE DRUMMER OF THE WOODS

Among permanent residents one of the most common is the Ruffed Grouse or Partridge. It, and other related species, are game birds which are protected by the game laws of the provinces. It is a bird about eighteen inches long, with upper parts chiefly brown, but variegated with black, gray and white; large tufts of broad, glossy black feathers on the neck; under parts chiefly white, tinged with buff and barred with blackish or grayish brown. The tail-feathers vary from gray to brown and are irregularly barred and mottled with black, with a broad dark band near the end. When the tail is spread it presents a beautiful, fan-like appearance. Of all the characteristics of this superb game bird, its habit of drumming is the most remarkable. The sound is produced by the male bird beating the air with his wings as he stands firmly braced on some favorite low perch. It is the call to his lady mate, who approaches the old rendezvous, shy but responsive. The same perch may be used by the old male year after year. On the ground at the base of a stump or tree, or beneath some brush, the nest is made. It may contain eight to fourteen pale yellowish-brown eggs about one and one-half inches long and an inch broad. The young can run about as soon as they are hatched, and when one week old can fly well. During the summer and autumn the grouse eats insects and berries and seeds, and in the winter leaves and buds. To keep itself warm during cold nights in winter, it burrows into a snow-drift and there passes the night. Sportsmen delight in hunting the Ruffed Grouse, and its flesh is much prized at the table.

OTHER MEMBERS OF THE PARTRIDGE FAMILY

The Canada Grouse or Spruce Partridge is a common inhabitant of Canadian coniferous forests. It has more feathers on the legs but the toes are bare. The throat is black, and is separated from the black breast by a

Copyright, 1913, 1918, by M. Perry Mills.

broken circular band of black and white. The tail is black, tipped with brown. Its eggs are larger than those of the Ruffed Grouse, and are more or less speckled or spotted with deep brown. This bird is sometimes called the Wood Partridge.

The Quail, or Bob-White, belongs to the same family. He is only about ten inches long. The male in winter has upper parts varying from reddish-brown to chestnut, a black band on the upper breast, the throat and a broad line from the bill over the eye white, the lower breast and belly white barred with black, and an ashy-gray tail. On the ground in grassy fields, the female lays ten to



Cooper's Hawk is one of the small hawks which fly over the poultry yards, pounce down on the chickens and carry them off. It is sometimes called the Chicken Hawk.

eighteen white eggs about one inch broad. It is found only in the warmer sections of Eastern Canada.

FEATHERED RAIDERS OF THE AIR

Hawks are birds of prey. They often make raids upon the poultry-yard, and always prefer feathered game to any other. The Sharp-shinned Hawk and Cooper's Hawk are those which often attack poultry. They are both small but possess great boldness and dexterity. The former is about one foot long with upper parts slaty-gray, primaries barred with blackish, white throat streaked with black, under parts barred with white and buff, and an ashy-gray, nearly square tail with blackish cross-bars and whitish tip. Cooper's Hawk is very similar but larger, and with the crown blackish.

They build nests in trees, fifteen to fifty feet above the ground, and lay three to six bluish-white eggs about two inches long. Because of its larger size, Cooper's Hawk is more destructive to poultry. Both are fearless, daring, aggressive; and watching their prey from a lookout, then flying swiftly and low, they make a sudden dash at the frightened animal, and grasp it in their talons. They are often called "Hen Hawks" and "Chicken Hawks."

The latter names are also applied to the Red-tailed Hawk, and the Red-shouldered Hawks. Both like chickens. The former is about twenty inches long, with upper parts brownish; upper breast heavily streaked with grayish-brown; the upper belly streaked, spotted or barred with black forming a kind of broken band across the belly; the lower belly generally white, and the tail rich brown, with a narrow black band near its end, and a white tip.

The Red-shouldered Hawk is about the same size, with conspicuous reddish-brown "shoulder" patches, and a blackish tail with four or five white cross-bars and a white tip. Both are common species, but give little trouble to the farmer, though unjustly blamed for the sins of their bird-killing relatives. They live chiefly on mice, moles, frogs and insects. The hawks already described are permanent residents in most parts of Canada.

THE MANY HAWKS WHICH ARE FOUND IN CANADA

The American Goshawk is a bird of northern regions, wintering as far south as Virginia. It is one of the most daring of all the hawks, and will dart down suddenly and carry off a chicken which may be only a few feet from a person. It is nearly two feet long, with upper parts bluish-slate color; a blackish head and the breast and belly barred pale-slate and white, with sharp black streaks. It nests in trees, and lays two to five white eggs faintly marked with pale brown. This hawk is so large and powerful that it is quite capable of killing and carrying off a full-grown hen.

The Marsh Hawk is often seen gracefully skimming over the low meadows, or occasionally hanging poised over one spot for a second or two and then dropping down into the long grass. This drop may mean the death of a mouse or a frog.

It seldom attacks a domestic fowl, but destroys an enormous number of field mice each year. The male has gray or ashy upper parts, silvery-gray tail, irregularly barred with black, and lower breast and belly white with bars or spots of rufous. It lays four to six dull white eggs on the ground in marshes. The most unsuspicious of all hawks is the Broad-winged Hawk, which is chiefly distinguished from other species by the three "notched" primaries and its smaller size. It breeds throughout Eastern North America. During early summer it may be seen for hours sitting on the dead top of some high tree. It feeds chiefly on mice, reptiles and insects.

The American Rough-legged Hawk, a large species characterized by feathered tarsi and heavily marked under parts, breeds in Canada and winters in the United States. It is somewhat nocturnal in habits, and may be seen in the fading twilight watching from some low perch or beating with measured, noiseless flight over its hunting ground. Its flight is seldom rapid, and often appears labored.

The Pigeon Hawk has slaty-blue upper parts, a rusty collar on the neck, three or four distinct grayish-white bars on the tail, and under parts of cream-buff or yellow streaked with black except on the throat. It nests in trees or on cliffs, and lives chiefly on small birds.

The American Sparrow Hawk is less than a foot long, with a brownish back more or less barred with black; slaty-blue head; under parts chiefly cream-buff, and belly and sides spotted with black. It breeds as far north as Hudson Bay and winters in the southern states. Its call is a high, quickly repeated "killy-killy-killy-killy;" and, as the name suggests, it lives on small birds, mammals, and insects.

THE FISHERMAN THAT SELDOM MISSES

The Fish Hawk or American Osprey is a common species. It has upper parts, head and nape brownish, varied with white, and white under parts. This species lives in colonies or in pairs, along our coasts, and returns year after year to the same nesting ground. Its note is a high, rapidly repeated, plaintive whistle. It is a good fisher. Winging its way slowly over the water, it keeps a close watch for fish. When one is observed, it hovers for a moment, then descends with rapid speed and directness, strikes the water with great force, making a loud splash, frequently disappears for a moment, then rises with its prey grasped in its powerful talons, and flies to a favorite perch.

The Golden Eagle is of rare occurrence east of the Mississippi, but the Bald Eagle breeds throughout North America. The head, neck, and tail are white, and the rest of the plumage brownish. They live chiefly near water, and subsist principally on fish. The nest is found in tall trees and contains two or three dull white eggs nearly three inches long.

NIGHT BIRDS THAT PREY ON SMALL BIRDS AND ANIMALS

Owls are found in all parts of the world, and about twenty species inhabit North America. They are chiefly woodland birds, while some make their home in towers or outbuildings. Owls are birds of prey, and birds of the night, living chiefly on small mammals. They have weird, human voices, and are usually regarded with superstitious fear. Their eggs are uniformly white and unmarked. Only a few common species will be described.

The Long-eared Owl has conspicuous ear-tufts an inch or more in length; upper parts brownish mottled with white; a tail with six or eight cross-bars, and sides and belly irregularly barred with brown. It spends the day in the shade of evergreens. "Like other owls, its flight is slow and wavering, but in common with them it is buoyant and devoid of any appearance of heaviness.

The Barred or Hoot Owl has no ear-tufts. The upper parts are grayish-brown; the under parts white; the breast barred, and the sides and belly broadly streaked with brown. The deep-toned, questioning voice, the absence of "horns," and the dark-brown, nearly black eyes, combine to make Barred Owls appear strangely human. Their usual call is a sonorous "whoo-whoo-whoo" uttered during the first part of the night and again before sunrise; or on moonlight nights throughout the night. The Saw-whet Owl is only about eight inches long. Its upper parts are cinnamon-brown; the back spotted with white; the tail with three or four imperfect white bars; the under parts white, heavily streaked with cinnamon-brown, and the legs and feet

feathered and buffy-white. It nests in a hole in a tree. During the day it frequents dark woods, and sleeps so soundly that often it may be captured alive. The Screech Owl is known by its small size and ear-tufts when seen; and when night comes, by its tremulous, wailing whistle—a weird, melancholy call welcomed by few. It frequently makes its home near dwellings, and may nest in them. Its favorite retreat is an old apple orchard, where the hollow limbs



The Screech Owl frequently lives in a hollow limb of an old apple tree, where it can hide through the day from the small birds that might attack it.

offer it refuge by day from smaller birds which may attack it.

THE GREAT OWLS OF THE WILDER REGIONS

The Great Horned Owl is nearly two feet long, and has conspicuous ear-tufts nearly two inches long. The upper parts are mottled with varying shades of buff and black; there is a white patch on the throat, and the under parts are a yellow-buff barred with black. The legs and feet are feathered, and the eyes are yellow. The Great Horned Owl is common in wilder, less settled, wooded regions, and is very fond of rabbits. Its call is a loud, piercing, blood-curdling scream. The Snowy Owl is a bird of cold, northern regions, but may wander southward in winter. It is large, without ear-tufts, and is white, with bars of grayish-brown. The legs and feet are heavily feathered, and the eyes are yellow. Its flight is firm, smooth and noiseless. It is diurnal in its habits, and is most active during the early morning and again before dusk. The Hawk Owl is also diurnal in habits, and its flight is swift and hawklike. It breeds in northern regions, and comes south in winter. The size is medium; the upper parts grayish-brown; the head and neck spotted with white; the under parts barred with brown and white, and the tail long and rounded.

WOODPECKERS THAT DESTROY THE ENEMIES OF OUR TREES

Woodpeckers, of several species, are common in Canada. As a rule they are solitary, and are the best climbers among all birds. Two toes of each foot are directed forward and two backward, except in one group, and this structure of the feet, together with the pointed, stiffened tail-feathers, assists them in clinging to upright surfaces. The bill is stout and chisel-like, and is used to cut away wood and reach grubs, which are drawn out of their hiding-places by the long tongue with its horny tip. Woodpeckers nest in dead trees, and lay white eggs.

A most common species is the Hairy Woodpecker, which is about ten inches long, with black upper parts, white under parts, wings spotted with white, a white stripe above and another below the eye, and the adult male has a scarlet patch on the back of the neck. The Downy Woodpecker is very similar in color and markings, except that in the latter the outer tail-feathers are white barred with black, and in the former they are white without bars. The Downy is shorter, and the feathers more downy and fluffy. He is the smallest and the best known of all our Woodpeckers. He visits the orchard and shade trees, and tells of his presence by the tap, tap, tap, on the trees as he patiently digs out grubs and larvæ. The valuable work done by these birds for the protection of our trees should commend them to every nurseryman. The toughest cocoon ever spun by a caterpillar is no protection against the sharp beaks of these birds. The food of both birds consists almost entirely of insects, with the seeds of the hemlock or the berries of the sumach for dessert.

The most beautiful bird of the family is the Red-headed Woodpecker with the head, neck, and upper breast deep red, the lower breast and belly white, and the upper parts and the tail black except the white hump and white patches on the wings. The Downy and the Hairy are winter residents but the Red-headed migrates southward in the autumn. They are noisy, active birds; and their brilliant plumage and loud, rolling call make them conspicuous. In early spring they feed on insects, which they catch on the wing; but after the small fruits ripen their tastes change, and they visit the strawberry and raspberry patches.

A WOODPECKER WITH FORTY NAMES

The Golden-winged Woodpecker has more colors and more names than any other bird. A few of its forty names are Flicker, High-hole, and Yellow-hammer; and these names are the reflections of its habits, notes and colors. The top of the head is a sky-gray; across the neck is a bright scarlet band; the upper parts are brownish-gray, barred with black; the sides of the head, throat and upper breast are yellowish-brown; a broad black stripe on either side of the throat runs backward from the base of the bill; a broad black crescent spans the breast; the under parts are white tinged with yellow, and the tail is black above, and yellow tipped with black below. The Flicker is a bird of character, and does not always follow the habits of the family. It does less woodpecking than any other of its class, and is really a ground feeder, living chiefly on grasshoppers and other ground insects.

The Yellow-bellied Sapsucker is another Woodpecker. The adult male has a crimson crown and chin, black and white wing coverts and back, wings black with a large white bar, black tail, breast black edged with yellowish, and the under parts dull yellowish and white sides streaked with black. It is a small woodpecker, which prefers sap to insects. In spring when the sap is rising it bores small holes in the bark of various trees, and sucks the sap which flows from the holes. Apart from this habit, which may render young trees somewhat unsightly, the bird has an excellent record. It devours great numbers of ants, beetles and moths, which it obtains from rotten wood. It is a summer resident only.

THE PILEATED WOODPECKER, "COCK OF THE WOODS"

The Pileated Woodpecker, known as the "Cock of the Woods," is about seventeen inches long, and is the largest of our woodpeckers. The male has a scarlet crown and crest, and a red mark extending back from the bill. The upper and under parts are brownish-black, and a broad white stripe extends from the bill backwards, on either side, to the wings. This bird is common only in the wilder parts of the country. Its flight is rather slow, and when under way, the markings of the wings show plainly. The Arctic Three-toed and the American Three-toed, as the names suggest, have only three toes on each foot, two in front and one behind. They are restless, active birds of northern regions.

The Nuthatches are closely related to the Woodpeckers. We have two species, the White-breasted and the Red-breasted. They are resident species frequently seen around cultivated lands in the winter. They are active insect destroyers, picking their food from bark, twigs and leaves; and are of great value to the fruit-grower because of the immense quantities of insect eggs and larvæ which they destroy. Their call is a nasal "yank-yank" and a repeated "ya-ya," all in the same tone. The White-breasted Nuthatch is about six inches long, with a bluish-black crown, slate upper parts, white under parts, and a short tail. The Red-breasted has the top of the head and a wide stripe through the eye shining black, a white line over the eye, the upper parts bluish-gray, the throat white, and the under parts reddish-brown. Few birds are more easily identified.

THE FRIENDLY CHICKADEES THAT HELP TO SAVE OUR FLOWERS

Chickadees are permanent residents, and are also insect-eating birds. They closely inspect the bark of trees for insect eggs and larvæ.

"Were it not for me,
Said a chickadee,
Not a single flower on earth would be;
For under the ground they soundly sleep,
And never venture an upward peep,
Till they hear from me,
Chickadee—dee—dee."

The Black-capped Chickadee is a small, fluffy bird with top of head, nape, and throat shining black, the sides of the head and neck white, the back ashy, the breast

white, with belly and sides washed with cream-buff. It builds a nest of moss, grass and feathers in old stumps, and lays five to eight small white eggs, spotted and speckled at the larger end with brown. The Hudsonian Chickadee has a dull, dark brownish-gray crown. No bird speaks its name so plainly as a chickadee, and no bird has more friends, because he is sociable with all. In an unconcerned way he hops from limb to limb, whistling softly the while, picking an insect egg from this crevice in the



The friendly little chickadees live with us through the snowy weather. They are friends of the gardener, for they live on the eggs and larvae of insects which are destructive to fruit trees and shrubs. These birds belong to the titmouse family.

bark and a larva from another, all the time performing acrobatic feats. After satisfying his appetite, he looks at the onlooker with his sparkling black. eyes, speaks to him in liquid gurgles, and then flies away to the woods.

THE LITTLE BROWN CREEPER SEARCHES FOR BUGS

The Brown Creeper is another small bird which, like the Chickadee, searches for insects, eggs and larvæ which are hidden in crevices of bark. He starts at the bottom of the trunk, and winds his way upward in a near-sighted manner. Having reached the top of his spiral staircase, he suddenly drops to the base of another tree and resumes his task. The upper parts are mixed brown and white, the rump pale brown, the tail grayish-brown, with feathers stiffened and pointed, and the under parts white. It builds its nest in the loose bark of a tree and lays five to eight spotted and speckled eggs.

GOOD AND BAD HABITS OF CROWS AND BLACKBIRDS

A Crow can speak for himself, and is well known to Canadian children. He is about twenty inches long, and black all over. The farmer is well acquainted with his corn-pulling habit, and even the "scare-crow" does not frighten him. He is a vegetarian to the extent of two-thirds of his diet, and one-half of this vegetable matter consists of grain, chiefly Indian corn. Sometimes he is guilty of destroying the eggs and young of small birds. On the other hand, he does much good by destroying injurious insects, mice and other rodents, and is valuable occasionally as a scavenger. He seems to rejoice in being an outlaw. He knows no fear, and laughs at attempts to entrap him. For many years, man has been his sworn enemy, yet he has held his own, and chatters loudly as ever in his harsh, scolding tones.

Blackbirds are closely related to crows, but are much smaller. Both walk, while most birds hop. The Bronze Grackle or Crow Blackbird breeds as far north as Labrador, and winters in the lower Mississippi Valley. It is about six inches long, and black all over. About the neck, throat, and upper breast, the male is a brilliant metallic-purple to bluish-green. The Rusty Blackbird is smaller, and the plumage of the male is a uniform glossy bluish-black. The female is slate-color in spring, and rusty-brown in fall and winter. The Red-winged Blackbird is distinguished by the patch of red and cream on the shoulders in the male. The female is smaller, grayish brown, and heavily streaked with brown or black.

Blackbirds are not liked by the farmer. Little can be said in their favor, except that at times they eat a large number of cutworms. They are early migrants, arriving in March and resorting at once to their nesting places in swamps or woods. Early in the season they live on insects, but as soon as grain is sown they visit the sown fields and help themselves liberally, varying their diet by robbing the nests of smaller birds, and taking as many eggs and young as they can.

THE NEXT STORY OF CANADA IS ON PAGE 3455.

ALICE'S ADVENTURES IN WONDERLAND

WE left Alice just after she got up and walked away from the Mad Tea-Party. It will be remembered that the behavior of the Hatter was altogether so rude that after she had tolerated his conduct for quite a long time she felt that she had to show him and the March Hare what she thought of them, by rising up and taking an abrupt leave of the party. As she went away they were trying to put the Dormouse in the teapot! Making her way through the wood, she vowed never to go there again. Her purpose was now to get into the beautiful garden, and this at last she managed to do. The adventures that befell her there are told in the following pages.

ALICE & THE QUEEN OF HEARTS

WITH THE MOCK TURTLE'S STORY & LOBSTER QUADRILLE

CONTINUED FROM 3096

ALICE got into the beautiful garden at last, but she had to nibble a bit of the mushroom again to bring herself down to twelve inches after she had got the golden key, so as to get through the little door. It was a lovely garden, and in it was the Queen's croquet-ground. The Queen of Hearts was very fond of ordering heads to be cut off. "Off with his head!" was her favorite phrase whenever anybody displeased her. She asked Alice to play croquet with her, but they had no rules; they had live flamingoes for mallets, and the soldiers had to stand on their hands and feet to form the hoops. It was extremely awkward, especially as the balls were hedgehogs, who sometimes rolled away without being hit. The Queen had a great quarrel with the Duchess, and wanted to take her head off. Alice found the state of affairs in the lovely garden not all so beautiful as she had expected. But after the game of croquet, the Queen said to Alice:

"Have you seen the Mock Turtle yet?"

"No," said Alice. "I don't even know what a mock turtle is."

"It's the thing mock turtle soup is made from," said the Queen.

"I never saw one or heard of one," said Alice.

"Come on, then," said the Queen, "and he shall tell you his history."

As they walked off together, Alice heard the King say in a low voice to the company generally: "You are all pardoned."

"Come, *that's* a good thing!" she said to herself, for she had felt quite unhappy at the number of executions the Queen had ordered.

They very soon came upon a gryphon, lying fast asleep in the sun.

"Up, lazy thing!" said the Queen; "and take this young lady to see the Mock Turtle, and to hear his history. I must go back and see after some executions I have ordered." And she walked off, leaving Alice alone with the Gryphon.

Alice did not quite like the look of the creature, but, on the whole, she thought it would be quite as safe to stay with it as to go after that savage Queen; so she waited.

The Gryphon sat up and rubbed its eyes; then it watched the Queen till she was out of sight, then it chuckled.

"What fun!" said the Gryphon, half to itself, half to Alice.

"What *is* the fun?" said Alice.

"Why, *she*," said the Gryphon. "It's all her fancy, that; they never executes nobody, you know. Come on!"

"Everybody says 'Come on' here," thought Alice, as she went slowly after it. "I never was so ordered about before in all my life, never!"

They had not gone far before they saw the Mock Turtle in the distance, sitting sad and lonely on a little

ledge of rock, and, as they came nearer, Alice could hear him sighing as if his heart would break. She pitied him deeply.

"What is his sorrow?" she asked the Gryphon, and the Gryphon answered, very nearly in the same words as before:

"It's all his fancy, that. He hasn't got no sorrow, you know. Come on!"

So they went up to the Mock Turtle, who looked at them with large eyes full of tears, but said nothing.

"This here young lady," said the Gryphon, "she wants for to know your history, she do."

"I'll tell it her," said the Mock Turtle in a deep, hollow tone. "Sit down, both of you, and don't speak a word till I've finished."

So they sat down, and nobody spoke for some minutes. Alice thought to herself: "I don't see how he can *ever* finish if he doesn't begin." But she waited patiently.



"Off with his head!" was the favorite phrase of the Queen of Hearts whenever anybody displeased her. She asked Alice to play croquet; but they followed no rules; they had live flamingoes for mallets, and the balls were living hedgehogs rolled up, who sometimes moved away without being hit.

"Once," said the Mock Turtle at last, with a deep sigh, "I was a real turtle."

These words were followed by a very long silence, broken only by an occasional exclamation of "Hjckrrh!" from the Gryphon, and the constant, heavy sobbing of the Mock Turtle. Alice was very nearly getting up and saying: "Thank you, sir, for your interesting story," but she could not help thinking there *must* be more to come, so she sat still and said nothing.

"When we were little," the Mock Turtle went on at last, more calmly, though still sobbing a little now and then, "we went to school in the sea. The master was an old turtle—we used to call him Tortoise——"

"Why did you call him Tortoise if he wasn't one?" Alice asked.

"We called him Tortoise because he taught us," said the Mock Turtle angrily. "Really, you are very dull!"

"You ought to be ashamed of yourself for asking such a simple question," added the Gryphon; and then they both sat silent and looked at poor Alice, who felt ready to sink into the earth. At last the Gryphon said to the Mock Turtle:

"Drive on, old fellow! Don't be all day about it!" And he went on in these words:

"Yes, we went to school in the sea, though you mayn't believe it——"

"I never said I didn't!" interrupted Alice.

"You did!" said the Mock Turtle.

"Hold your tongue!" added the Gryphon, before Alice could speak again. The Mock Turtle went on:

"We had the best of educations—in fact, we went to school every day——"

"*I've* been to a day-school, too," said Alice. "You needn't be so proud as all that."

"With extras?" asked the Mock Turtle a little anxiously.

"Yes," said Alice; "we learned French and music."

"And washing?" said the Mock Turtle.

"Certainly not!" said Alice indignantly.

"Ah, then yours wasn't a really good school!" said the Mock Turtle, in a tone of great relief. "Now, at *ours* they had at the end of the bill, 'French, music, *and washing*—extra.'"

"You couldn't have wanted it much, living at the bottom of the sea."

"I couldn't afford to learn it," said the Mock Turtle, with a sigh. "I only took the regular course."

"What was that?" inquired Alice.

"Reeling and Writhing, of course, to begin with," the Mock Turtle replied; "and then the different branches of Arithmetic — Ambition, Distraction, Uglification, and Derision."

"I never heard of 'Uglification,'" Alice ventured to say. "What is it?"

The Gryphon lifted up both its paws in surprise.

"Never heard of uglifying!" it exclaimed. "You know what to beautify is, I suppose?"

"Yes," said Alice doubtfully; "it means — to — make — anything — prettier."

"Well, then," the Gryphon went on, "if you don't know what to uglify is, you *are* a simpleton."

Alice did not feel encouraged to ask any more questions about it, so she turned to the Mock Turtle, and said: "What else had you to learn?"

"Well, there was Mystery," the Mock Turtle replied, counting off the subjects on his flappers — "Mystery, ancient and modern, with Seaography; then Drawling—the Drawling-master was an old conger-eel, that used to come once

THE MOCK TURTLE TELLS HIS STORY TO ALICE AND THE GRYPHON



"Once," said the Mock Turtle, with a deep sigh, "I was a real turtle." These words were followed by a long silence, broken only by an occasional exclamation of "Hjckrrh!" from the Gryphon, and the constant sobbing of the Turtle. Alice was very nearly getting up and saying: "Thank you, sir, for your interesting story," but she could not help thinking there *must* be more to come, so she sat still and said nothing.

a week; *he* taught us Drawling, Stretching, and Fainting in Coils."

"What was *that* like?" said Alice.

"Well, I can't show it you myself," the Mock Turtle said; "I'm too stiff. And the Gryphon never learned it."

"Hadn't time," said the Gryphon. "I went to the Classical master, though. He was an old crab, *he* was."

"I never went to him," the Mock Turtle said, with a sigh. "He taught Laughing and Grief, they used to say."

"So he did, so he did," said the Gryphon, sighing in its turn. And both creatures hid their faces in their paws.

"And how many hours a day did you do lessons?" said Alice, in a hurry to change the subject.

"Ten hours the first day," said the Mock Turtle; "nine the next, and so on."

"What a curious plan!" exclaimed Alice.

"That's the reason they're called lessons," the Gryphon remarked; "because they lessen from day to day."

This was quite a new idea to Alice, and she thought it over a little before she made her next remark.

"Then the eleventh day must have been a holiday?"

"Of course it was," said the Mock Turtle.

"And how did you manage on the twelfth?" Alice went on eagerly.

"That's enough about lessons," the Gryphon interrupted, in a very decided tone. "Tell her something about the games now."

The Mock Turtle sighed deeply, and drew the back of one flapper across his eyes. He looked at Alice, and tried to speak; but for a minute or two sobs choked his voice.

"Same as if he had a bone in his throat," said the Gryphon, and it set to work shaking him and punching him in the back.

At last the Mock Turtle recovered his voice, and, with tears running down his cheeks, he went on again:

"You may not have lived much under the sea"—"I haven't," said Alice—"and perhaps you were never even introduced to a lobster" (Alice began to say, "I once tasted——" but checked herself, and said, "No, never") "so you can have no idea what a delightful thing a Lobster Quadrille is!"

"No, indeed," said Alice. "What sort of a dance is it?"

"Why," said the Gryphon, "you first form into a line along the sea-shore——"

"Two lines!" cried the Mock Turtle. "Seals, turtles, salmon, and so on. Then when you've cleared all the jelly-fish out of the way——"

"*That* generally takes some time," interrupted the Gryphon.

"You advance twice——"

"Each with a lobster as a partner!" cried the Gryphon.

"Of course," the Mock Turtle said. "Advance twice, set to partners——"

"Change lobsters, and retire in same order," continued the Gryphon.

"Then, you know," the Mock Turtle went on, "you throw the——"

"The lobsters!" shouted the Gryphon, with a bound into the air.

"As far out to sea as you can——"

"Swim after them!" screamed the Gryphon.

"Turn a somersault in the sea!" cried the Mock Turtle, capering wildly about.

"Change lobsters again!" yelled the Gryphon, at the top of its voice.

"Back to land again, and—that's all the first figure," said the Mock Turtle, suddenly dropping his voice. And the two creatures, who had been jumping about like mad things all this time, sat down again very sadly and quietly, and looked at Alice.

"It must be a very pretty dance," said Alice timidly.

"Would you like to see a little of it?" said the Mock Turtle.

"Very much indeed," said Alice.

"Come, let's try the first figure," said the Mock Turtle to the Gryphon. "We can do without lobsters, you know. Which shall sing?"

"Oh, *you* sing!" said the Gryphon. "I've forgotten the words."

So they began solemnly dancing round and round Alice, every now and then treading on her toes when they passed too close, and waving their fore-paws to mark the time; while the Mock Turtle sang this, very slowly and sadly:

"Will you walk a little faster?" said a whiting to a snail,
"There's a porpoise close behind us, and he's treading on my tail.



"Come, let's try the first figure," said the Mock Turtle to the Gryphon. "We can do without lobsters, you know." So they began dancing round Alice, every now and then treading on her toes when they passed too close, and waving their fore-paws to mark the time; while the Mock Turtle sang very slowly and sadly.

See how eagerly the lobsters and the turtles
all advance!
They are waiting on the shingle—will you
come and join the dance?
Will you, won't you, will you, won't you,
will you join the dance?
Will you, won't you, will you, won't you,
won't you join the dance?
"You can really have no notion how delightful
it will be
When they take us up and throw us, with the
lobsters, out to sea!"
But the snail replied "Too far, too far!" and
gave a look askance—
Said he thanked the whiting kindly, but he
would not join the dance.
Would not, could not, would not, could not,
would not join the dance.
Would not, could not, would not, could not,
could not join the dance.
"What matters it how far we go?" his
scaly friend replied,
"There is another shore, you know, upon
the other side.
The further off from England the nearer is
to France—
Then turn not pale, beloved snail, but come
and join the dance.
Will you, won't you, will you, won't you,
will you join the dance?
Will you, won't you, will you, won't you,
won't you join the dance?"

"Thank you; it's a very interesting dance to watch," said Alice, feeling very glad that it was over at last. "And I do so like that curious song about the whiting."

"Oh, as to the whiting," said the Mock Turtle, "they—— You've seen them, of course?"

"Yes," said Alice; "I've often seen them at dinn——"

She checked herself hastily.

"I don't know where Dinn may be," said the Mock Turtle; "but if you've seen them so often, of course you know what they're like."

"I believe so," Alice replied thoughtfully. "They have their tails in their mouths, and they're all over crumbs."

"You're wrong about the crumbs," said the Mock Turtle. "Crumbs would all wash off in the sea. But they *have* their tails in their mouths; and the reason is——" Here the Mock Turtle yawned and shut his eyes. "Tell her about the reason, and all that," he said to the Gryphon.

"The reason is," said the Gryphon, "that they *would* go with the lobsters to the dance. So they got thrown out to sea. So they had to fall a long way. So they got their tails fast in their mouths. So they couldn't get them out again. That's all."

"Thank you," said Alice, "it's very interesting. I never knew so much about a whiting before."

"I can tell you more than that, if you like," said the Gryphon. "Do you know why it's called a whiting?"

"I never thought about it," said Alice. "Why?"

"*It does the boots and shoes,*" the Gryphon replied very solemnly.

Alice was thoroughly puzzled. "Does the boots and shoes!" she repeated in a wondering tone.

"Why, what are *your* shoes done with?" said the Gryphon. "I mean, what makes them so shiny?"

Alice looked down at them, and considered a little before she gave her answer. "They're done with blacking, I believe."

"Boots and shoes under the sea," the Gryphon went on in a deep voice, "are done with whiting. Now you know."

"And what are they made of?" Alice asked, in a tone of great curiosity.

"Soles and eels, of course," the Gryphon replied rather impatiently. "Any shrimp could have told you that."

"If I'd been the whiting," said Alice, whose thoughts were still running on the song, "I'd have said to the porpoise: 'Keep back, please; we don't want *you* with us.'"

"They were obliged to have him with them," the Mock Turtle said. "No wise fish would go anywhere without a porpoise."

"Wouldn't it, really?" said Alice, in a tone of great surprise.

"Of course not!" said the Mock Turtle. "Why, if a fish came to *me*, and told me he was going on a journey, I should say: 'With what porpoise?'"

"Don't you mean 'purpose'?" said Alice.

"I mean what I say," the Mock Turtle replied in an offended tone. And the Gryphon added: "Come, let's hear some of *your* adventures."

"I could tell you my adventures, beginning from this morning," said Alice, a little timidly; "but it's no use going back to yesterday, because I was a different person then."

"Explain all that," said the Mock Turtle.

"No, no; the adventures first!" said the Gryphon impatiently. "Explanations take such a dreadful time."

So Alice began telling them her adventures from the time when she first saw the White Rabbit. After a while a cry of "The trial's beginning!" was heard in the distance.

"Come on!" cried the Gryphon. And, taking Alice by the hand, it hurried off. . . . "What trial is it?" Alice panted, as she ran, but the Gryphon only answered: "Come on!" and ran the faster.

The King and Queen of Hearts were seated on their throne when they arrived, with a great crowd assembled about them—all sorts of little birds and beasts, as well as the whole pack of cards. The Knave was standing before them, in chains, with a soldier on each side to guard him; and near the King was the White Rabbit, with a trumpet in one hand, and a scroll of parchment in the other. In the very middle of the court was a table, with a large dish of tarts upon it. They looked so good that it made Alice quite hungry to look at them. "I wish they'd get the trial done," she thought, "and hand round the refreshments." But there seemed to be no chance of this, so she began looking at everything about her to pass away the time. . . .

The twelve jurors were all writing very busily on slates. "What are they doing?" Alice whispered to the Gryphon. "They can't have anything to put down yet, before the trial's begun."

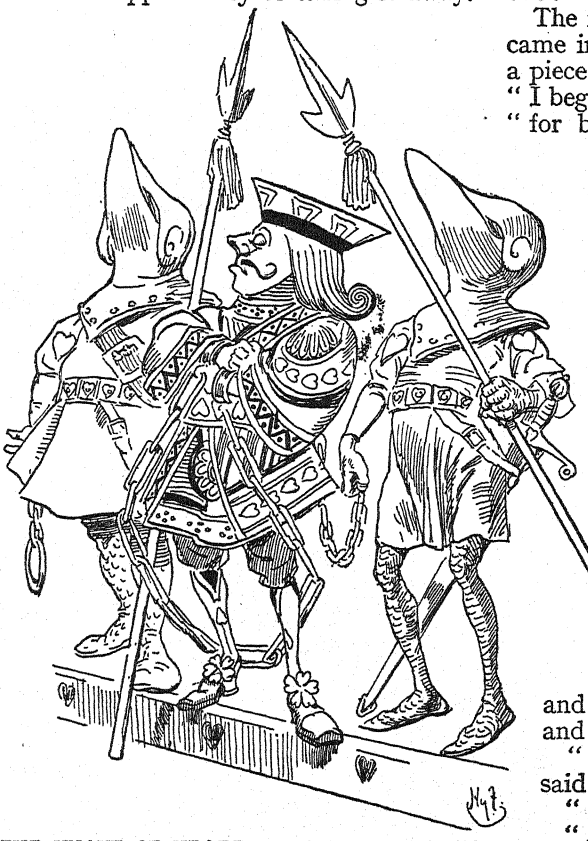
"They're putting down their names," the Gryphon whispered in reply, "for fear they should forget them before the end of the trial."

"Stupid things!" Alice began in a loud, indignant voice, but she stopped herself hastily, for the White Rabbit cried out: "Silence in the court!" and the King put on his spectacles and looked anxiously round, to make out who was talking.

Alice could see, as well as if she were looking over their shoulders, that all the jurors were writing down "stupid things!" on their slates, and she could even make out that one of them didn't

know how to spell "stupid," and that he had to ask his neighbor to tell him. "A nice muddle their slates 'll be in before the trial's over!" thought Alice.

One of the jurors had a pencil that squeaked. This, of course, Alice could *not* stand, and she went round the court and got behind him, and very soon found an opportunity of taking it away.



THE KNAVE OF HEARTS WHO STOLE THE TARTS

She did it so quickly that the poor little juror (it was Bill, the Lizard) could not make out at all what had become of it; so, after hunting all about for it, he was obliged to write with one finger for the rest of the day. And this was of very little use, as it left no mark on the slate.

"Herald, read the accusation!" said the King.

On this the White Rabbit blew three blasts on the trumpet, and then unrolled the parchment scroll, and read as follows:

"The Queen of Hearts, she made some tarts,
All on a summer's day;
The Knave of Hearts, he stole those tarts,
And took them quite away."

"Consider your verdict," the King said to the jury.

"Not yet, not yet!" the Rabbit hastily interrupted. "There's a great deal to come before that!"

"Call the first witness," said the King; and the White Rabbit blew three blasts on the trumpet, and called out: "**First** witness!"

The first witness was the Hatter. He came in with a teacup in one hand and a piece of bread and butter in the other. "I beg pardon, your Majesty," he began, "for bringing these in; but I hadn't quite finished my tea when I was sent for."

"You ought to have finished," said the King. "When did you begin?"

The Hatter looked at the March Hare, who had followed him into the court, arm in arm with the Dormouse. "Fourteenth of March, I *think* it was," he said.

"Fifteenth," said the March Hare.

"Sixteenth," added the Dormouse.

"Write that down," the King said to the jury; and the jury eagerly wrote down all three dates on their slates, and then added them up and reduced the answer to shillings and pence.

"Take off your hat," the King said to the Hatter.

"It isn't mine," said the Hatter.

"*Stolen!*" the King exclaimed, turning to the jury, who instantly made a memorandum of the fact.

"I keep them to sell," the Hatter added as an explanation; "I've none of my own. I'm a hatter."

Here the Queen put on her spectacles, and began staring hard at the Hatter, who turned pale and fidgeted.

"Give your evidence," said the King; "and don't be nervous, or I'll have you executed on the spot."

This did not seem to encourage the witness at all; he kept shifting from one foot to the other, looking uneasily at the Queen, and in his confusion he bit a large piece out of his teacup instead of the bread and butter.

Just at this moment Alice felt a very

curious sensation, which puzzled her a good deal until she made out what it was. She was beginning to grow larger again, and she thought at first she would get up and leave the court; but on second thoughts she decided to remain where she was as long as there was room for her.

"I wish you wouldn't squeeze so," said the Dormouse, who was sitting next to her. "I can hardly breathe."

"I can't help it," said Alice very meekly; "I'm growing."

"You've no right to grow *here*," said the Dormouse.

"Don't talk nonsense," said Alice more boldly; "you know you're growing, too."

"Yes, but *I* grow at a reasonable pace," said the Dormouse, "not in that ridiculous fashion." And he got up very sulkily and crossed over to the other side of the court.

All this time the Queen had never left off staring at the Hatter, who trembled so that he shook both his shoes off.

"Give your evidence," the King repeated angrily, "or I'll have you executed, whether you're nervous or not."

"I'm a poor man, your Majesty," the Hatter began in a trembling voice, "and I hadn't but just begun my tea—not above a week or so—and what with the bread and butter getting so thin—and the twinkling of the tea ——"

"The twinkling of *what*?" said the King.

"It *began* with the tea," the Hatter replied.

"Of course, twinkling begins with a T!" said the King sharply. "Do you take me for a dunce? Go on!"

"I'm a poor man," the Hatter went on, "and most things twinkled after that—only the March Hare said——"

"I didn't!" the March Hare interrupted in a great hurry.

"You did!" said the Hatter.

"I deny it!" said the March Hare.

"He denies it," said the King; "leave out that part."

"Well, at any rate, the Dormouse said——" the Hatter went on, looking anxiously round to see if he would deny it too; but the Dormouse denied nothing, being fast asleep.

"After that," continued the Hatter, "I cut some more bread and butter—"

"But what did the Dormouse say?" one of the jury asked.

"That I can't remember," said the Hatter.

"You *must* remember," remarked the King, "or I'll have you executed."

The miserable Hatter dropped his tea-cup and bread and butter, and went down on one knee. "I'm a poor man, your Majesty," he began.

"You're a *very* poor *speaker*," said the King.

Here one of the guinea-pigs cheered, and was immediately suppressed by the officers of the court. . . .

"If that's all you know about it, you may stand down," continued the King.

"I can't go no lower," said the Hatter; "I'm on the floor, as it is."

"Then you may *sit* down," the King replied.

Here the other guinea-pig cheered, and was suppressed.

"Come, that finishes the guinea-pigs!" thought Alice. "Now we shall get on better."

"I'd rather finish my tea," said the Hatter, with an anxious look at the Queen.

"You may go," said the King; and the Hatter hurriedly left the court, without even waiting to put on his shoes. "——and just take his head off outside," the Queen added to one of the officers; but the Hatter was out of sight before the officer could get to the door.

"Call the next witness!" said the King. . . .

Alice watched the White Rabbit as he fumbled over the list, feeling very curious to see what the next witness would be like, "for they haven't got much evidence *yet*," she said to herself. Imagine her surprise when the White Rabbit read out, at the top of his shrill little voice, the name "Alice!"

"Here!" cried Alice, quite forgetting in the flurry of the moment how large she had grown in the last few minutes, and she jumped up in such a hurry that she tipped over the jury-box with the edge of her skirt, upsetting all the jurymen on to the heads of the crowd below, and there they lay sprawling about, reminding her very much of a globe of gold-fish she had accidentally upset the week before.

"Oh, I *beg* your pardon!" she exclaimed in a tone of great dismay, and began picking them up again as quickly

as she could, for the accident of the gold-fish kept running in her head, and she had a vague sort of idea that they must be collected at once and put back into the jury-box, or they would die.

"The trial cannot proceed," said the King, in a very grave voice, "until all the jurymen are back in their proper places—*all*," he repeated with great emphasis, looking hard at Alice as he said so.

Alice looked at the jury-box, and saw that, in her haste, she had put the Lizard in head downwards, and the poor little thing was waving its tail about in a melancholy way, being quite unable to move. She soon got it out again, and put it right; "not that it signifies much," she said to herself; "I should think it would be *quite* as much use in the trial one way up as the other."

As soon as the jury had a little recovered from the shock of being upset, and their slates and pencils had been found and handed back to them, they set to work very diligently to write out a history of the accident, all except the Lizard, who seemed too much overcome to do anything but sit with its mouth open, gazing up into the roof of the court.



The whole pack of cards came flying down upon her; she gave a little scream, and tried to beat them off. Then she found herself lying on the bank, with her head in the lap of her sister, who was gently brushing away some dead leaves that had fluttered from the trees on her face.

"What do you know about this business?" the King said to Alice.

"Nothing," said Alice.

"Nothing *whatever*?" persisted the King.

"Nothing whatever," said Alice.

"That's very important," the King said, turning to the jury. They were just beginning to write this down on their slates, when the White Rabbit interrupted. "*Un*important, your Majesty means, of course," he said, in a very respectful tone, but frowning and making faces at him as he spoke.

"*Un*important, of course, I meant," the King hastily said, and went on to himself in an undertone, "important—unimportant — unimportant — important——" as if he were trying which word sounded best.

Some of the jury wrote it down "important," and some "unimportant." . . . At this moment the King, who had been for some time busily writing in his notebook, called out "Silence!" and read out from his book: "Rule Forty-two. *All persons more than a mile high to leave the court.*"

Everybody looked at Alice.

"*I'm* not a mile high," said Alice.

"You are," said the King. "Nearly two miles high," added the Queen.

"Well, I shan't go, at any rate," said Alice. "Besides, that's not a regular rule; you invented it just now."

"It's the oldest rule in the book," said the King.

"Then it ought to be Number One," said Alice.

The King turned pale, and shut his notebook hastily. "Consider your verdict," he said to the jury, in a low, trembling voice. . . . "No, no!" said the Queen. "Sentence first—verdict afterwards."

"Stuff and nonsense!" said Alice loudly. "The idea of having the sentence first!"

"Hold your tongue!" said the Queen, turning purple.

"I won't!" said Alice.

"Off with her head!" the Queen shouted at the top of her voice. Nobody moved.

"Who cares for you?" said Alice (she had grown to her full size by this time). "You're nothing but a pack of cards!"

At this the whole pack rose up into the air, and came flying down upon her; she gave a little scream, half of fright and half of anger, and tried to beat them off, and found herself lying on the bank, with her head in the lap of her sister, who was gently brushing away some dead leaves that had fluttered down from the trees on her face.

"Wake up, Alice dear!" said her sister. "Why, what a long sleep you've had!"

"Oh, I've had such a curious dream!" said Alice; and she told her sister, as well as she could remember them, all these strange adventures of hers that we have just been reading about; and when she had finished, her sister kissed her, and said: "It *was* a curious dream, dear, certainly. But now run in to your tea; it's getting late."

So Alice got up and ran off, thinking while she ran, as well she might, what a wonderful dream it had been.

THE FABLES OF ÆSOP THE SLAVE

THE OLD HOUND

A HOUND who had worked well in the hunt for many years at last became old and feeble. One day when hunting the stag he happened to be the first to come up to the animal, and seized him by the leg; but his old broken teeth were not able to hold tightly, and so the deer escaped. Thereupon his master flew into a great rage and began to strike the dog with his stick. The poor old hound replied:

"Do not strike your old servant. I would gladly serve you still, but I have not the strength. If I am not of much use now, remember how useful I have been."

Never despise old people because they are feeble and perhaps not very sharp. Remember how much good work they did while they were able.

THE TOWN MOUSE AND THE COUNTRY MOUSE

THE country mouse one day received a visit from another mouse who lived in the town, and who had been his playfellow when quite young. He did his best to provide the town mouse with nice food, but it was quite clear that he did not care much about it. The town mouse presently said to him:

"How can you put up with this horrid little hole in a farmyard where it is often cold and wet, when you might come to the town with me and live in a fine house and have all kinds of nice things to eat?"

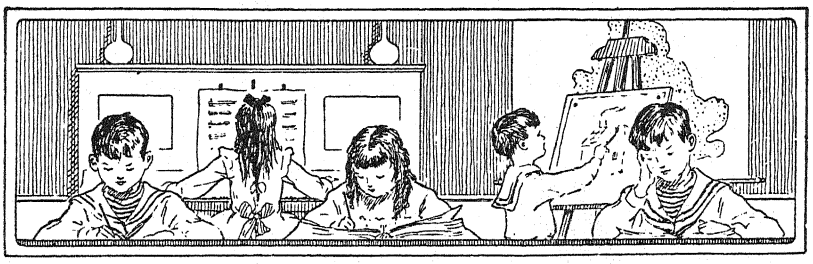
He soon persuaded the country mouse, and the two set out that night to return to town, and safely arrived at the house where the town mouse lived. Here the country mouse found everything very comfortable. He sat on a rich carpet and ate scraps of all manner of nice things that had been served for supper. He was enjoying himself very much, when suddenly the noise of someone opening the door and the barking of two or three dogs that came running in nearly frightened the country mouse out of his wits, and he was only just able to escape in time.

When he recovered his breath, he exclaimed:

"If this is town life it will not do for me. I would rather have my poor quiet hole in the farmyard, where I can live in peace and safety."

We should not envy rich people, for they often have much more care and trouble than the poor.

THE NEXT STORIES ARE ON PAGE 3207.



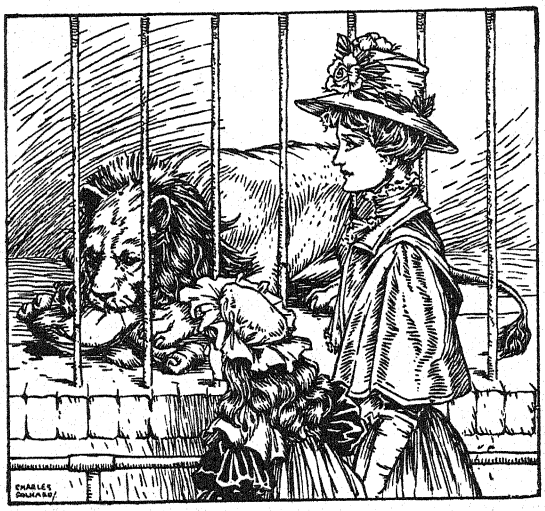
READING

THE DIFFERENT KINDS OF PRONOUNS

CONTINUED FROM 2928

WE left off our last lesson at the point where the Pronouns HE, SHE, IT were invited out to tea, and, I am sorry to say, behaved rather rudely. But these are not the only Pronouns, so they need not get conceited.

Now, suppose mother takes you one afternoon to the ZOO to see the animals there; and suppose you are in the place where the LIONS are kept; and suppose it is just feeding-time, and you are watching one great lion eating his dinner; and suppose you turned to mother and said, "Oh, I say, mother, don't YOU think HE is a beauty?" What would you have been doing? You would have been using a sentence with three different Pronouns in it. When you are talking about yourself, you say I; when you are talking to your mother, you say YOU; and when you point to the lion and talk about him, you say HE. And these are three different persons: (1) yourself, (2) mother, (3) the lion. We will be very polite, and call the lion a person, so that if ever we meet him out in the street we can tell him that we always treated him with great respect, and then, perhaps, he will not hurt us.



Now, there is a different Pronoun for each of the three persons: I is the Pronoun used by the person speaking when he is speaking about himself; YOU is the Pronoun of the person spoken to; and He is the Pronoun of the person spoken about. And these are called the First Person, the Second Person, and the Third Person. So we can draw up a little plan like this:

PRONOUNS

1st Person	2nd Person	3rd Person
I	YOU	HE

But we learned before, on page 1465, that there were two kinds of people and animals—males and females; so when we talk about a male person or animal we say HE,

but when we talk about a female we say SHE. If you were telling me a story about a girl, you would not say HE, but SHE; and you would not begin a history lesson about King John by saying, "Now, as to King John, SHE was a very bad man." Everybody would laugh at you if you did, and no wonder. Once more, if you were talking about a thing instead of a person, you would say IT; you would say, "I don't like this pen; IT won't write." You would not say, "SHE won't write." So our plan can now grow a little bigger:

1st Person	2nd Person	3rd Person
I	YOU	HE, SHE, IT

But suppose there were two of you, you and your brother, and you had been to the circus; what would you say when father asked you, "Well, how did you both enjoy yourselves?"

You would not say, "I enjoyed it very much," for that would not mean both of you; so you would have to say, "WE enjoyed it very much." And if you were talking about two lions, or three men, or four tables, you would say THEY, wouldn't you? So our plan grows bigger still:

1st Person	
Singular	Plural
I	WE
2nd Person	
Singular	Plural
YOU	YOU
3rd Person	
Singular	Plural
HE, SHE, IT	THEY

We sometimes use THOU for the Singular of the Second Person, but not often, except in our prayers to God.

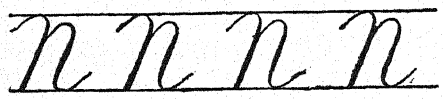
Here are some of the Pronouns in a funny rhyme:

I like my porridge very hot,
But YOU prefer yours cold;
HE is a baby in a cot,
But SHE is very old.
IT eats its breakfast on its head,
But THEY like theirs best in bed.

WRITING

CAPITAL M, N, S, L AND D

"WE are now going to see how to make N and M, your letter and mine, Nora; but these are capital letters" said her mother at the next writing lesson. "There are two ways of making them; we will learn the usual one first. There is N. What do you think of your letter, Nora?"



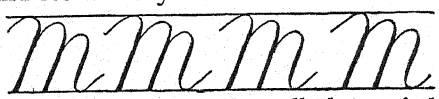
Nora noticed that the first pot-hook was twice the height of little n, but the second pot-hook ending in the pot-hanger was not so high as the first. Her mother said now Nora would be able to write her name quite the right way, beginning with a capital N.

"Perhaps M makes its capital in the same way. Does it, mother?" asked Tom.

"See if you can make one," was the reply.

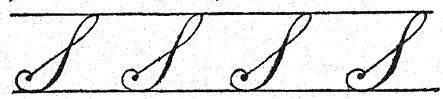
Tom took his pencil, looked at N, made a little m, and then wrote a small m very big, like n in three parts instead of two. He made the last two pot-hooks the same height as one another.

"Nearly right!" exclaimed his mother. "Now watch me write M, and see where yours is different."



Tom saw at once that all three of the pot-hooks were of different heights, none alike; and Nora said it reminded her of a staircase, and that it would be easy to distinguish her own letter from her mother's, because the M was grown up and bigger than N.

"Another time you shall learn the other capital N and M; but to-day capital S is waiting its turn. Here it is," said the mother, as she wrote it.

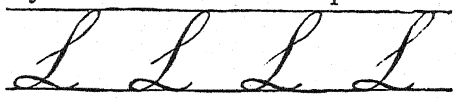


Nora and Tom looked at it, and noticed how very like a little s it was, really s with a big loop at the top.

"That loop," said their mother, "reminds us of the loop of string they tie on to parcels in the shops to help us carry them. S begins the word swing. That will remind us."

"Tom swings them on his forefinger, when he carries them for us," said Nora. "So you will remember capital S, Tom."

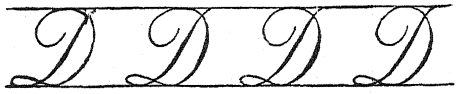
When the children had written S, they were shown another capital letter.



"Mother, I thought you were going to make S again," said Nora; "but you did not begin the long up-stroke quite so far down as with S."

"But the L ends quite differently," replied her mother. "Instead of the down-stroke turning round to the left and ending in a dot, it makes a loop, and the pencil comes down to touch the line again on the other side of the down-stroke, and turns up at the end; so, you see, L has two loops. I has one loop, but L has two loops."

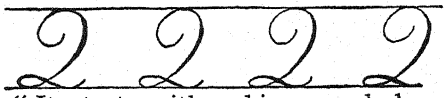
The next letter to be written was D.



"D needs care in making," the children were warned. "Other letters have parts like it. The down-stroke ends like the lower loop of L, and the pencil touches the line again on the other side of it; it then goes right up and round, passes the top of the down-stroke, makes a half-circle round to the left, and ends near the down-stroke. Look well at the letter before copying it."

Tom and Nora found D wanted more care to write nicely than any letter they had yet made, but they persevered till their D's were good and even, and then they were shown how to write the remaining capital letter, Q.

"Here is Q," said their mother, as she wrote it like this:



"It starts with a big curved down-stroke, reaching below the upper line, turns up and round to the right, and the down-stroke ends exactly like L's. It is only the upper part that is new to us, and the letter is very much like a giant 2, with a loop."

In our next lesson we shall learn something quite new—how to make figures.

ARITHMETIC

MULTIPLYING BIG NUMBERS TOGETHER

IN our last lesson we saw how to find the value of ten times a given number. We have only to move each figure from its own place into the next place on the left. This leaves us with no figure for the unit's place, so that we must put a 0 into it. Thus, the number 34, when multiplied by 10, gave us 340.

Now, it is clear that if we take 10 times 34, and add to it another 10 times 34, we shall then have 20 times 34. In other words, to find 20 times a given number, we must not only move each figure from its own place to the next place on the left, but we must also double each figure.

Thus, to arrange our work on paper, we place the multiplier, 20, under the 34, so that the 0 comes one place to the right of the unit's place in the multiplicand (as we call the number to be multiplied). Then, since we have to double the 34, we say: Twice 4 are 8, twice 3 are 6. We have for the answer 68. As we have multiplied only by 2, and not by 2 *tens*, or 20, you see at once that the answer is ten times too small. To make it right, bring down the 0 to the unit's place, which moves each figure one place to the left, and therefore multiplies the number by ten, giving the correct answer 680.

```
  34
  20
 ---
 680
```

Now that we understand *why* we do this, we may just as well write the 0 in the unit's place *first*, and then multiply the number by 2, setting down the figures of the result to left of the 0.

How much is 20 times 1728?

As before, write the multiplier, 20, so that its 0 is below and to the right of the unit's figure of the 1728.

Then, first, put 0 into the unit's place; next, twice 8, 16, put down 6, carry 1; twice 2, 4, and 1, 5, put down 5; twice 7, 14, put down 4, carry 1; twice 1, 2, and 1, 3.

```
 1728
   20
 ----
34560
```

It is evident that we multiply by 30, 40, 50, and so on, in the same way. For example, to find 70 times 234, we have this:

234
70 — Put 0 in the unit's place. Multiply 234 by 7.
16380

This leads us to the multiplication by 100. If we followed the same rule, we should first have 0 in the unit's place, and then 10 times the number on the left of this 0. But to get 10 times the number we simply have to write a 0 after it. Thus, our answer consists of the given number *with the two* 0's *after it.*

So, to multiply a number by 100, write 00 after it.

Another way of seeing the same thing is this. Take the number 34 as an example. We want each figure to be 100 times its present value. Therefore, 4 units become 4 hundreds, and 3 tens become 3 thousands; so we must have a 3 in the thousand's place, a 4 in the hundred's place, and fill in the tens and units with 0's.

We now come to the method of multiplying by any other number consisting of two figures.

Suppose we have to find the value of 43 times 126.

It is quite evident that if we first write 126 *three* times, and add, and then write it *forty* times and add, we shall, by adding these two results together, obtain forty-three times 126. That is what we actually do, the work being arranged in the following way:

126
43 — Write the multiplier, 43, with its unit's figure, 3,
378 = 3 times 126 — under the unit's
504 = 40 times 126 — figure, 6, of 126.
5418 = 43 times 126 — First, multiplying 126 by 3, we get 378. Then, multiplying 126 by 40, we get 504 *tens.* Placing them in columns as we have learned to do, and adding them, we have 5418, which is 43 times 126.

Let us look carefully at one or two things in working this problem. When we multiply by 3, we say, 3 times 6 units equal 18 units—that is, 1 ten and 8 *units.* We put the 8 into the unit's place and carry the 1 ten. Three times 2 tens are 6, plus 1 ten carried are 7 tens, the 7 to be in the ten's place. Three times 1 hundred are 3 hundred, the 3 to be in the hundred's place.

Next, we must multiply 126 by 4, which makes 504; but, as we have really multiplied by 4 *tens,* each figure must be moved one place to the left, so that 4 will be in the ten's place, under the 7, the 0 in the hundred's place, under the 3, and the 5 in the thousand's place. You can see that an 0 is understood in the unit's place, but is not necessary, as the position of the figures in columns has already given each its value.

Notice, also, that in both lines of our multiplication we *write the first figure of our result under the figure by which we are multiplying.* The work is done as follows:

126
43 — 4 sixes, 24; put down 4 *under the* 4 *by which we multiply,* carry 2. 4 twos 8, and 2, 10; put down 0, carry 1. 4
378 — ones, 4, and 1, 5. Next, 3
504 — sixes, 18; put down 8 *under the* 3 *by which we multiplied,*
5418 — carry 1. 3 twos, 6, and 1, 7. 3 ones, 3. Add 378 and 504(0) = 5418.

This method may be used in multiplying by numbers of any size, unless one 0, or more, occurs in the multiplier. Let us see what can be done in such a case. Multiply 126 by 403.

126
403 — Multiplying by 3 units we have 378. There are *no tens* by which to multiply, so we must leave that for the present. Next, multiply 126 by
504 — 4, as we have learned to do,
50778 — and we have 504. As we have really multiplied by 4 hundreds (400), each figure must be moved 2 places to the left, as there are 2 zeros in 400, and as the 4 *must* be put under the 4 of the multiplier. Adding the results, we have the answer 50778.

If you will compare this answer with that obtained when we multiplied 126 by 43, you will see that, although we could not multiply by 0, we really had to keep a place for it in the ten's column, and so we may as well put it there.

ANSWERS TO EXAMPLES ON PAGE 2924.

1. 1524 plants. 2. 2056 lines.
3. 418 pennies.
4. Sixty-four thousand eight hundred and eighty-one. 5. 1701 marbles.

THE BEAUTIFUL LAND OF SOUND

WE have had such happy times with our little fairies, and have been so pleased with the kind goblins, that I am sure we are quite ready to go a little farther, and find out how we can make their beautiful secrets our own.

We must learn to know all the different ways of touching the notes, and many other things besides. We must know what to do when we want to hear soft, singing voices. If we would hear the wings of the wind—for fairies and goblins love the great storm spirit—we must learn the secret of quite a different way of approaching the notes. When an artist paints a picture, he does not try to manage with one brush; he has need of many. There are the large, bold effects which need big brushes; there are the dainty little details requiring the lightest treatment, such as no big brush could ever give.

So it is with our magic kingdom, the piano; if only we take the trouble to find the right brushes the secrets will come to us, and, when we play, those who listen will lose themselves in the beauty of the story which the fairies have taught us.

Once upon a time there was a very great man, who knew the wonderful language of the music fairies so well that his name will never die. He wrote deep, glorious music, which one day you and I will enjoy. His name was Beethoven, and if we want to understand and to learn from him, we must know what it is to listen to the songs in the trees, to hear the fairy music in the rippling stream, and to see the wee folk flying by in the fleeting white clouds. The great Beethoven loved country rambles; he was always happy when he was with dear Mother Nature, and she taught him songs. The fairies are keeping these wonderful songs for us—songs that will never die.



THE BEAUTIFUL LAND OF SOUND BEHIND THE STONE WALL

Many of these beautiful themes came to him while he sat under a tree, and he scribbled them down then and there, so that his wonder dreams should be shared by all the children of earth. He has given us stories of lightning and thunder; sometimes his music shows us the story

of the sunset, or he takes us into the quiet, and we feel he is telling us of peaceful summer skies. Yes, he has left us every sort of song that mortal ear can hear, and if we want to conjure up these stories for ourselves, if we want the piano fairies to help us, we have much to learn.

There are many little exercises which will do great things for us, if we learn them carefully; and if we begin to wonder why such funny things are necessary, we must remember how many beautiful stories are waiting for us, if only we have the patience to learn how to discover all they have to say.

Quite the best, and yet the most difficult thing of all, is to play a simple melody. The piano must really *sing*. Through all the interesting work we are going to do together, that one idea must be our king of thoughts—*the piano must sing*. We must listen very carefully to each tone to be quite sure that we are treating all the fairies equally well. We have a king of thoughts, and now we have found the queen, and as we want to remember both of them, we must say them over again to ourselves.

We must learn how to make the piano sing. We must never touch a note without listening to it.

Why are we talking like this before doing one single exercise? Well, this wonderful world of music is an enchanted land, and its many gates can be opened even by us, although it is possible for them to remain fast locked. It all depends on whether we know the right keys.

We shall have to think very much about our fingers, a great deal about our hand, and our arm will need much thought, too; but all that is only the means to the end. We are like travelers in a new country, and we come to a high stone wall. Some people think only of the stones, but we have heard that there is a glorious treasure inside, and we are eager to find it as quickly as possible. See, between the stones there is a chink, which shows a glimpse of the light within. So, while we work away at the stones—that is, while we do our exercises with all our will and best endeavor—let us never forget that the object of our working is to get through the chink into the treasure-house where so much beauty is waiting for us.

DRAWING

MEASURING THINGS FROM A DISTANCE

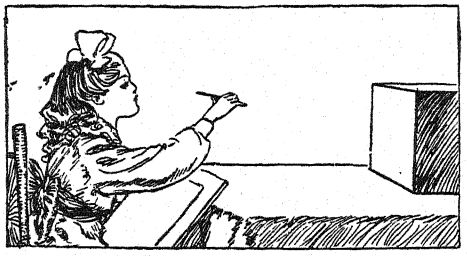
THE box we drew some time ago was placed in front of us—just opposite, and below the eye. Let us see if we can draw it in another position—a little to the left, and still below the eye. When we drew the flat sheet of paper, and learned how to draw the book, we found that the side-lines slanted away from us towards the point immediately opposite us, and as far away as we could see when we looked straight in front of us.

We can understand a little better about these lines if we look at a straight road leading away from us, or at straight railway lines. The road seems to get narrower in the distance, and the railway lines to run closer together. Standing at one end of a room, and looking at the opposite end, we see the floor lines slanting up, and the ceiling lines down towards our own eye-level. Tall men and women see more than short ones, or than little children, and people standing on heights see more than those on the level ground.

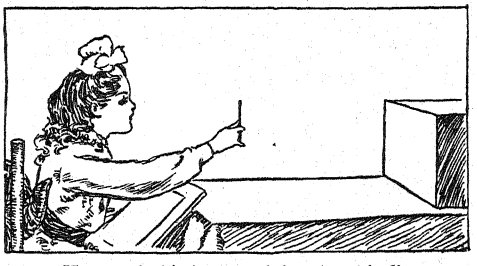
So we see that our drawings must be of objects as *we* see them ourselves. The sketches of the boxes on the following page will help us to draw some from our own view, but nobody else's drawing will show quite the same view as ours; so we must make our own drawing, and not copy other people's.

Shall we put our box a little on the right-hand side, so that we see the top and one side? We will draw it in black and white chalk on brown paper, beginning with the side nearest to us. If the box is square, the side will not look quite square, for shapes alter if they are moved sideways from the eye, as they do, too, when moved nearer or further in an opposite direction. But we must be careful not to exaggerate this alteration of shape; and to prevent our doing this, there is a way of measuring lines at a distance which

is very useful. It is always rather difficult to learn new ways; but after a little practice we shall find that this one is quice worth the trouble.

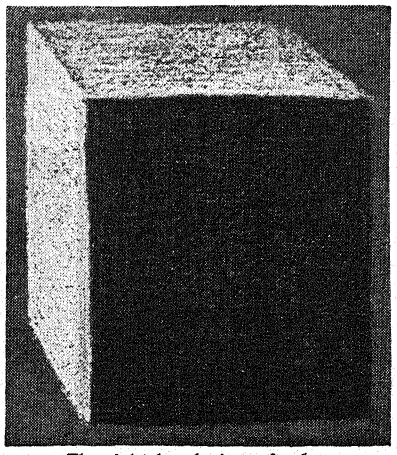


How to hold the pencil for the top line.



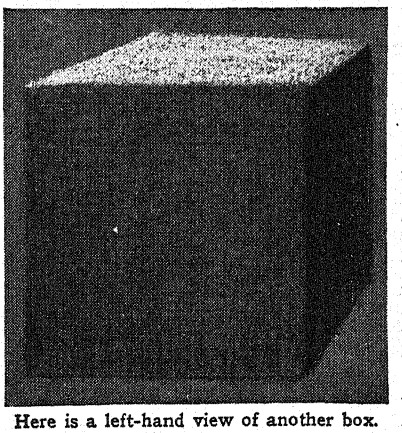
How to hold the pencil for the side line.

We shall want a long pencil—or a ruler even. We must sit quite straight, and hold the pencil at arm's length, and keep one eye tightly shut. The pencil must be held in a horizontal position, one end hiding one top corner of the box from our view. With the forefinger of the other hand we mark where the other corner is, on the pencil. Let us rest a little now, taking care not to lose the measurement we have made on the pencil—we can hold it at that place with the right hand till we are ready to shut one eye again.



The right-hand view of a box.

Now, still keeping the fingers of the right hand on the first measurement, and holding the pencil upright at arm's length against one of the edges of the front side of the box, we can find out if the top or the side edge seems longer, by seeing if the part we measured in the horizontal position of the pencil is bigger or smaller than the part we measured when we held it upright. This way of measuring seems rather tiresome at first, but all artists find they must use it to get the proportion of things—that is, how wide or how narrow anything is in proportion to its height, or how big one thing is in proportion to another. We shall be able by-and-by to get the proper proportion of big things at a distance, like ships or buildings. People who cannot use this sort of measurement sometimes draw cows as big as churches, and men and women as big as the houses in the same picture.



Here is a left-hand view of another box.

One thing we have to remember, though, is that we do not measure the actual size of anything in this way—only the *proportion* of one part to another. We choose for ourselves how big to draw the things according to the size we want our picture to be.

Now we will try to draw the box, using all the things we have learned to help us. Lines furthest from the eye slant most, so the lowest lines slant up the most. Those further to the right or left slant more than those nearer. The top of the box would look narrower than the bottom if we could see both, because it is higher, and therefore nearer the eye-level. In putting in shading we must not show the chalk outline, because we do not see it in the real box. The outlines of objects have no black lines round them. They are shown by difference of light and shade.

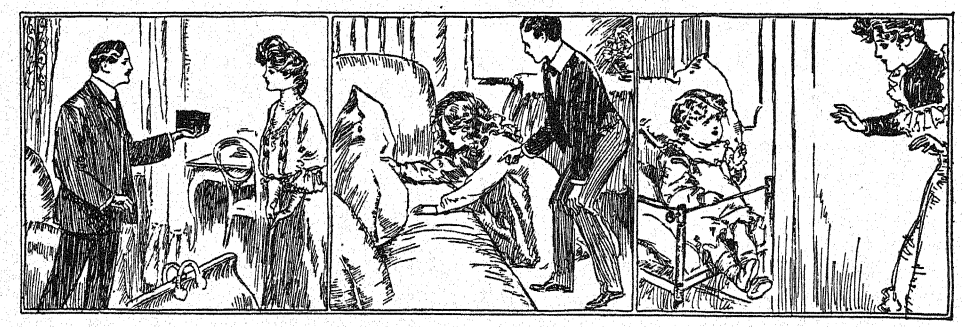
LITTLE PICTURE-STORIES IN FRENCH

First line: French. Second line: English words. Third line: As we say it in English.

Il est dix heures et demie. Quelqu'un frappe à la porte. La bonne l'ouvre.
It is ten hours and half. Someone knocks at the door. The maid it opens.
It is half-past ten o'clock. Someone knocks at the door. The maid opens it.
C'est le facteur. Il a apporté un télégramme à Papa. Papa le lit vite.
This is the postman. He has brought a telegram to Papa. Papa it reads quickly.
It is the postman. He has brought Papa a telegram. Papa reads it quickly.
Papa dit qu'il doit aller à Londres pour affairs pendant quelque temps.
Papa says that he must to go to London for business during some time.
Papa says that he must go to London on business for a while.



Maman et la bonne cherchent un portemanteau. Elles le remplissent d'habits.
Mamma and the nurse look for a portmanteau. They it fill of clothes.
Mamma and Nurse are looking for a portmanteau. They fill it with clothes.
Elles ferment le portemanteau et elles tournent la clef. Papa entre.
They shut the portmanteau and they turn the key. Papa enters.
They shut the portmanteau and turn the key. Papa comes in.
Il veut mettre un livre dans le portemanteau pour le lire en route.
He wishes to put a book into the portmanteau for it to read in route.
He wants to put a book into the portmanteau to read on the way.
"Où est la clef?" demande Papa. Nous ne pouvons pas la trouver.
"Where is the key?" demands Papa. We (not) are able not it to find.
"Where is the key?" asks Papa. We cannot find it.



Il faut qu'il arrive à temps pour le train, et il se fait tard.
It is necessary that he arrives at time for the train, and it itself makes late.
He must be in time for the train, and it is getting late.
Nous cherchons sur la table, sur le plancher, et sous le sofa. Elle est perdue.
We search on the table, on the floor, and under the sofa. It is lost.
We search on the table, on the floor, and under the sofa. It is lost.
Puis la bonne crie: "La méchante!" La clef est dans la bouche de Bébé!
Then the nurse cries: "The naughty!" The key is in the mouth of Baby!
Then Nurse cries: "Naughty child!" The key is in Baby's mouth!

THE NEXT LESSONS ARE ON PAGE 3329.

A FAMOUS POEM BY LORD BYRON

LORD BYRON'S famous poem tells the story of three brothers who were imprisoned in the ancient castle of Chillon, which still stands on the Lake of Geneva. They suffered in the cause of religion. Two of them died in the prison, and were buried beneath the floor of the dungeon in which they were immured. The third of the brothers, who tells the story as set forth in the poem, was set free at last, but having lost, by the death of his two brothers, all that he held dear, his freedom came too late to be enjoyed, and the poem ends with his saying: "Even I regained my freedom with a sigh." Only a portion of the famous poem is here given, but it contains some of the finest passages, and particularly that in which the poet makes the prisoner say that if the bird which visited him and sang to him in his loneliness had indeed been the spirit of his brother, it would not have heedlessly flown away after cheering him with its song.

THE PRISONER OF CHILLON

CONTINUED FROM 3042

O GOD! it is a fearful thing
To see the human soul take wing
In any shape, in any mood:
I've seen it rushing forth in blood,
I've seen it on the breaking ocean
Strive with a swol'n, convulsive motion,
I've seen the sick and ghastly bed
Of sin delirious with its dread;
But these were horrors—this was woe
Unmix'd with such—but sure and slow;
He faded, and so calm and meek,
So softly worn, so sweetly weak,
So tearless, yet so tender, kind,
And grieved for those he left behind;
With all the while a cheek whose bloom
Was a mockery of the tomb,
Whose tints as gently sunk away
As a departing rainbow's ray;
An eye of most transparent light,
That almost made the dungeon bright,
And not a word of murmur, not
A groan o'er his untimely lot—
A little talk of better days,
A little hope my own to raise,
For I was sunk in silence—lost
In this last loss, of all the most;
And then the sighs he would suppress
Of fainting Nature's feebleness,
More slowly drawn, grew less and less:
I listened, but I could not hear;
I call'd, for I was wild with fear;
I knew 'twas hopeless, but my dread
Would not be thus admonished;
I call'd, and thought I heard a sound—
I burst my chain with one strong bound,
And rushed to him—I found him not,
I only stirr'd in this black spot,
I only lived, I only drew
The accursed breath of dungeon-dew;
The last, the sole, the dearest link
Between me and the eternal brink,
Which bound me to my failing race,
Was broken in this fatal place.
One on the earth, and one beneath—
My brothers—both had ceased to breathe:
I took that hand which lay so still,
Alas! my own was full as chill;
I had not strength to stir, or strive,
But felt that I was still alive—
A frantic feeling when we know
That what we love shall ne'er be so.
I know not why
I could not die,
I had no earthly hope but faith,
And that forbade a selfish death.

What next befell me then and there
I know not well—I never knew—
First came the loss of light and air,
And then of darkness, too:
I had no thought, no feeling—none—
Among the stones I stood a stone,
And was scarce conscious what I wist,
As shrubless crags within the mist;
For all was blank, and bleak, and grey;
It was not night, it was not day;
It was not even the dungeon-light,
So hateful to my heavy sight,
But vacancy absorbing space,
And fixedness without a place;
There were no stars, no earth, no time,
No check, no change, no good, no crime,
But silence and a stirless breath
Which neither was of life nor death;
A sea of stagnant idleness,
Blind, boundless, mute, and motionless!

A light broke in upon my brain—
It was the carol of a bird;
It ceased, and then it came again,
The sweetest song ear ever heard,
And mine was thankful till my eyes
Ran over with the glad surprise,
And they that moment could not see
I was the mate of misery;
But then, by dull degrees, came back
My senses to their wonted track;
I saw the dungeon walls and floor
Close slowly round me as before,
I saw a glimmer of the sun
Creeping as it before had done,
But through the crevice where it came
That bird was perched, as fond and tame,
And tamer than upon the tree;
A lovely bird with azure wings,
And song that said a thousand things,
And seem'd to say them all to me!
I never saw its like before,
I ne'er shall see its likeness more;

It seem'd like me to want a mate,
But was not half so desolate,
And it was come to love me when
None lived to love me so again,
And cheering from my dungeon's brink,
Had brought me back to feel and think.
I know not if it late were free,
  Or broke its cage to perch on mine;
But knowing well captivity,
  Sweet bird! I could not wish for thine!
Or if it were, in winged guise,
A visitant from Paradise;
For—Heaven forgive that thought! the while
Which made me both to weep and smile—
I sometimes deem'd that it might be
My brother's soul come down to me;
But then at last away it flew,
And then 'twas mortal well I knew,
For he would never thus have flown,
And left me twice so doubly lone,
Lone as the corse within its shroud,
Lone as a solitary cloud—
  A single cloud on a sunny day,
While all the rest of heaven is clear,
A frown upon the atmosphere,
That hath no business to appear
  When skies are blue, and earth is gay.

THE OLD CLOCK ON THE STAIRS

We have often seen in reading through the BOOK OF POETRY how the poets have contrived to express in the music of words something of the sound and movement of actual life. Here, in this famous poem by Henry W. Longfellow, the writer takes a very familiar subject, and yet we find that he invests an old clock with mysterious and almost dramatic interest. Every little effect of his verse is carefully correct, and the stately, sober, unceasing swing of the pendulum is rendered in a most impressive way in the solemn refrain "For ever—never! Never—for ever!"

SOMEWHAT back from the village street
  Stands the old-fashioned country seat.
Across its antique portico
Tall poplar-trees their shadows throw;
And from its station in the hall
An ancient timepiece says to all:
  "For ever—never!
  Never—for ever!"

By day its voice is low and light;
But in the silent dead of night,
Distinct as a passing footstep's fall
It echoes along the vacant hall,
Along the ceiling, along the floor,
And seems to say at each chamber door:
  "For ever—never!
  Never—for ever!"

Through days of sorrow and of mirth,
Through days of death and days of birth,
Through every swift vicissitude
Of changeful time, unchanged it has stood,
And as if, like God, it all things saw,
It calmly repeats those words of awe:
  "For ever—never!
  Never—for ever!"

In that mansion used to be
Free-hearted Hospitality;
His great fires up the chimney roared;
The stranger feasted at his board;
But, like the skeletons at the feast,
That warning timepiece never ceased:
  "For ever—never!
  Never—for ever!"

There groups of merry children played,
There youths and maidens dreaming strayed;
Oh, precious hours! Oh, golden prime,
And affluence of love and time!
Even as a miser counts his gold,
Those hours the ancient timepiece told:
  "For ever—never!
  Never—for ever!"

From that chamber, clothed in white,
The bride came forth on her wedding night;
There, in that silent room below,
The dead lay in his shroud of snow;
And in the hush that followed the prayer,
Was heard the old clock on the stair:
  "For ever—never!
  Never—for ever!"

All are scattered now and fled,
Some are married, some are dead;
And when I ask, with throbs of pain,
"Ah, when shall they all meet again?"
As in the days long since gone by,
The ancient timepiece makes reply:
  "For ever—never!
  Never—for ever!"

Never here—for ever there,
Where all parting, pain, and care,
And death, and time shall disappear,
For ever there, but never here!
The horologe of Eternity
Sayeth this incessantly:
  "For ever—never!
  Never—for ever!"

THE SPRING WALK

Thomas Miller, who wrote these simple verses descriptive of the pleasant sights and sounds that mark a country walk in the days of spring, was a very interesting character. Born at Gainsborough, in Lincolnshire, August 31, 1807, he was apprenticed to a basket-maker; but having a real love of Nature and a desire to improve himself, he learned to read and write, and, some of his verses being seen by Rogers, the poet banker, he was encouraged to go to London, where he lived for years as a bookseller and author, and died in 1874. "The Sun," on page 1513, is by the same poet.

WE had a pleasant walk to-day,
  Over the meadows and far away,
Across the bridge by the water-mill,
By the woodside, and up the hill;
And if you listen to what I say,
I'll tell you what we saw to-day.

Amid a hedge, where the first leaves
  Were peeping from their sheaths so shy,
We saw four eggs within a nest,
  And they were blue as the summer's sky.

An elder-branch dipp'd in the brook,
  We wondered why it moved, and found
A silken-hair'd, smooth water-rat
  Nibbling and swimming round and round.

Where daisies open'd to the sun,
  In a broad meadow, green and white,
The lambs were racing eagerly—
  We never saw a prettier sight.

We saw upon the shady banks
  Long rows of golden flowers shine,
And first mistook for buttercups
  The star-shaped yellow celandine.

Anemones and primroses,
  And the blue violets of spring,
We found whilst listening by a hedge
  To hear a merry ploughman sing.

And from the earth the plough turn'd up
There came a sweet refreshing smell,
Such as the lily of the vale
Sends forth from many a woodland dell.

We saw the yellow wallflower wave
Upon a mouldering castle wall,
And then we watched the busy rooks
Among the ancient elm-trees tall.

And leaning from the old stone bridge,
Below we saw our shadows lie,
And through the gloomy arches watch'd
The swift and fearless swallows fly.

We heard the speckle-breasted lark
As it sang somewhere out of sight,
And we tried to find it, but the sky
Was fill'd with clouds of dazzling light.

We saw young rabbits near the wood,
And heard a pheasant's wing go " whir " ;
And then we saw a squirrel leap
From an old oak-tree to a fir.

We came back by the village fields,
A pleasant walk it was across 'em,
For all behind the houses lay
The orchards red and white with blossom.

Were I to tell you all we saw,
I'm sure that it would take me hours ;
For the whole landscape was alive
With bees, and birds, and buds, and flowers.

THE FAITHFUL BIRD

In this poem William Cowper is very probably describing an incident from his own experience with his pet birds. There is not much in the story he has to tell, and yet how pleasant it is to read, and how gently it conveys a little lesson to us which should make us entertain the kindliest feelings for the " happy prisoners " of the cage.

THE greenhouse is my summer seat ;
My shrubs, displaced from that retreat,
Enjoy'd the open air ;
Two goldfinches whose sprightly song
Had been their mutual solace long
Lived happy prisoners there.

They sang as blithe as finches sing
That flutter loose on golden wing,
And frolic where they list ;
Strangers to liberty, 'tis true,
But that delight they never knew,
And therefore never miss'd.

But Nature works in every breast
With force not easily suppress'd ;
And Dick felt some desires,
That, after many an effort vain,
Instructed him at length to gain
A pass between the wires.

The open windows seem'd to invite
The freeman to a farewell flight ;
But Tom was still confin'd ;
And Dick, although his way was clear,
Was much too generous and sincere
To leave his friend behind.

So settling on his cage, by play,
And chirp, and kiss, he seem'd to say,
You must not live alone—
Nor would he quit that chosen stand
Till I, with slow and cautious hand,
Return'd him to his own.

THE COUNCIL OF HORSES

John Gay, born at Barnstaple in 1685, and died in London, December 4, 1732, was a poet who had much success in his own day, and although his works, as a whole, are now but little read, many of his songs and shorter poems have enduring merit. While best known as the author of the " Beggar's Opera," his " Fables " are perhaps the most quoted of all his writings, and of these we have selected the following example, which is very familiar in style and " moral."

UPON a time a neighing steed,
Who graz'd among a numerous breed,
With mutiny had fired the train,
And spread dissension through the plain
On matters that concern'd the state ;
The council met in grand debate.
A colt whose eyeballs flamed with ire,
Elate with strength and youthful fire,
In haste stept forth before the rest,
And thus the listening throng address'd :
" Goodness, how abject is our race,
Condemn'd to slavery and disgrace !
Shall we our servitude retain,
Because our sires have borne the chain ?
Consider, friends, your strength and might ;
'Tis conquest to assert your right.
How cumbrous is the gilded coach !
The pride of man is our reproach.
Were we design'd for daily toil,
To drag the ploughshare through the soil,
To sweat in harness through the road,
To groan beneath the carrier's load ?
How feeble are the two-legg'd kind !
What force is in our nerves combin'd !
Shall, then, our nobler jaws submit
To foam and champ the galling bit ?
Shall haughty man my back bestride ?
Shall the sharp spur provoke my side ?
Forbid it, heavens ! Reject the rein ;
Your shame, your infamy, disdain.
Let him the lion first control,
And still the tiger's famish'd growl.
Let us, like them, our freedom claim,
And make him tremble at our name."
A general nod approv'd the cause,
And all the circle neigh'd applause.
When, lo ! with grave and solemn pace,
A steed advanc'd before the race,
With age and long experience wise ;
Around he cast his thoughtful eyes,
And, to the murmurs of the train,
Thus spoke the Nestor of the plain :
" When I had health and strength like you,
The toils of servitude I knew ;
Now grateful man rewards my pains,
And gives me all these wide domains.
At will I crop the year's increase ;
My latter life is rest and peace.
I grant, to man we lend our pains,
And aid him to correct the plains ;
But doth not he divide the care,
Through all the labours of the year ?
How many thousand structures rise,
To fence us from inclement skies !
For us he bears the sultry day,
And stores up all our winter's hay.
He sows, he reaps the harvest's gain ;
We share the toil and share the grain ;
Since every creature was decreed
To aid each other's mutual need,
Appease your discontented mind,
And act the part by Heaven assign'd."
The tumult ceas'd, the colt submitted,
And, like his ancestors, was bitted.

THE WIND AND THE MOON

Dr. George Macdonald, to whose rich fancy we owe this charming poem, wrote many fine novels. We could almost guess from reading the following that he could write a pretty fairy tale, and he really did write many delightful stories of fairyland. He was a remarkable preacher, and altogether a man of very original mind. Born at Huntly, Aberdeenshire, in 1824, he died in Italy on September 18, 1905.

SAID the Wind to the Moon, "I will blow you out!
You stare
In the air
As if crying 'Beware!'
Always looking what I am about.
I hate to be watched! I will blow you out!"

The Wind blew hard, and out went the Moon.
So, deep
On a heap
Of clouds, to sleep
Down lay the Wind, and slumbered soon,
Muttering low, "I've done for that Moon!"

He turned in his bed: she was there again!
On high
In the sky,
With her one ghost-eye,
The Moon shone white and alive and plain.
Said the Wind, "I will blow you out again!"

The Wind blew hard, and the Moon grew slim.
"With my sledge
And my wedge
I have knocked off her edge!
I will blow," said the Wind, "right fierce and grim,
And the creature will soon be slimmer than slim!"

He blew and he blew, and she thinned to a thread.
"One puff
More's enough
To blow her to snuff!
One good puff more where the last was bred,
And glimmer, glimmer, glum will go that thread!"

He blew a great blast, and the thread was gone.
In the air
Nowhere
Was a moonbeam bare:
Larger and nearer the shy stars shone:
Sure and certain the Moon was gone!

The Wind he took to his revels once more;
On down
And in town,
A merry, mad clown,
He leaped and holloed with whistle and roar—
When there was a glimmering thread once more!

He flew in a rage—he danced and blew;
But in vain
Was the pain
Of his bursting brain,
For still the Moon-scrap the broader grew
The more that he swelled his big cheek and blew.

Slowly she grew—till she filled the night,
And shone
On her throne
In the sky alone,
A matchless, wonderful, silvery light,
Radiant and lovely, the queen of the night.

Said the Wind, "What a marvel of power am I!
With my breath,
In good faith,
I blew her to death!
First blew her away right out of the sky,
Then blew her in: what a strength am I!"

But the Moon she knew naught of the silly affair;
For high
In the sky,
With her one white eye,
Motionless miles above the air,
She never had heard the Wind blare.

THE BEST SCHOOL OF ALL

There is, of course, but one "best school," and that is the one at which each of us has been a scholar. Our own old school, no matter what others may think of theirs, is to us "the best school of all." Mr. Henry Newbolt, one of the finest living poets, in these ringing and vigorous verses celebrates with the true touch of boyish patriotism the memory of all our schooldays. One would be sorry for the "old boy" who could not sing this fine song and feel it to be true, for he would have missed one of the real pleasures of life. It is here reprinted by special permission of Mr. Newbolt.

IT'S good to see the school we knew,
The land of youth and dream,
To greet again the rule we knew
Before we took the stream:
Though long we've missed the sight of her,
Our hearts may not forget;
We've lost the old delight of her,
We keep her honour yet.

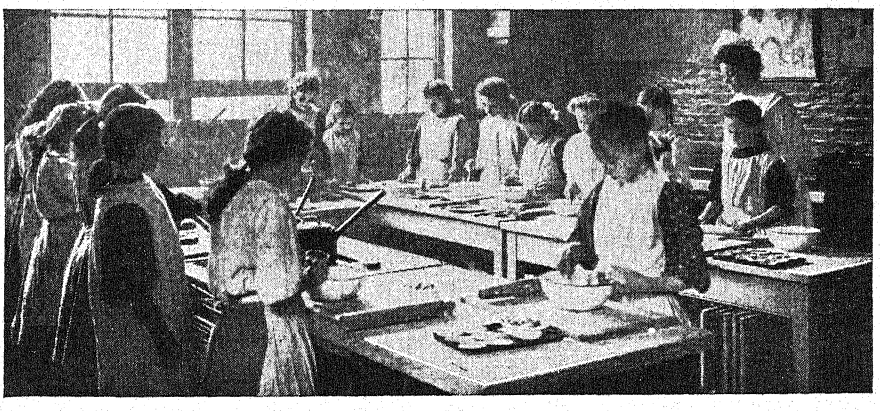
We'll honour yet the school we knew,
The best school of all:
We'll honour yet the rule we knew,
Till the last bell call
For, working days or holidays,
And glad or melancholy days,
They were great days and jolly days
At the best school of all.

The stars and sounding vanities
That half the crowd bewitch,
What are they but inanities
To him that treads the pitch?
And where's the wealth, I'm wondering,
Could buy the cheers that roll,
When the last charge goes thundering
Beneath the twilight goal?

The man that tanned the hide of us,
Our daily foes and friends,
They shall not lose their pride of us
Howe'er the journey ends.
Their voice, to us who sing of it,
No more its message bears,
But the round world shall ring of it
And all we are be theirs.

To speak of Fame a venture is,
There's little here can bide,
But we may face the centuries,
And dare the deepening tide:
For though the dust that's part of us
To dust again be gone,
Yet here shall beat the heart of us—
The school we handed on!

We'll honour yet the school we knew,
The best school of all:
We'll honour yet the rule we knew,
Till the last bell call.
For, working days or holidays,
And glad or melancholy days,
They were great days and jolly days
At the best school of all.



THE REAL VALUE OF FOODS

CONTINUED FROM 3100



A MOST important question, which we commonly forget to think about at all, though it is far more important than any food fad, is the question: How and when to eat. We have already been careful to learn the part that is played by the teeth in proper eating. We know how important that is, not only for itself, but because it starts the great chain of digestion. We need say nothing more about that here, provided that we do not forget it. But though the use of the teeth is the first part of the answer to the question, there are other things to learn.

As we know, the value of what we eat entirely depends upon the proper working of what we call digestion, and digestion entirely depends upon the brain, just as breathing does, or the beating of the heart. Now, there are certain states of the brain in which digestion simply cannot occur. The food passes on, but wherever it goes, no digestive juices are poured out to meet it. Perhaps even it is not allowed to pass on, but is returned by the stomach, and we are sick. The wise stomach, knowing its duty as one of the guardians of the body, says to the food: "I cannot digest you, the brain will not allow me to do so; and I know that if I pass you on without having done my share of the work, a great deal of harm will be done. In fact, there is no good to be got from you, but only harm, and therefore I must do my very unpleasant duty of throwing you out." I wonder whether, when we are sick, we have ever thought of it from that point of view?

Now, our business is to learn what are those states of the brain and the mind in which eating can do us only harm. If we understand this question, we can protect ourselves by sensibly fasting for a little while. What is scarcely less important, we can protect other people at least to the extent that we shall not pester them to eat when they ought not to eat. It is not wise to pester people in these states because the wise appetite fails on these occasions, and so a person who is not able to digest is commonly protected from the bad effects which are bound to follow if food is put into his stomach. The pity is that we do not trust the appetite.

Now, if we were grown up, we should know what are the states of the brain and the mind in which one ought not to eat; or, at any rate, ought to eat only very lightly and carefully. But many children have no experience in themselves of the

two great conditions, fatigue and worry, which arrest digestion, and in which it is positively harmful to eat. But though happy children may never have known what these words really mean, yet some day they will grow up, and it is well that they should study this question beforehand.

How worry and fear can spoil our appetites

A man may sit down to his breakfast, consisting of the usual things which he is accustomed to eat with delight, fragrant coffee, hot, crisp toast, fresh eggs, and so on. But the smell of every one of these things, this particular morning, makes him feel sick and horrible. He must get away from the room, or he will be ill; and yet that man is perfectly well, and just the same as he has always been, so far as anything that we can see is concerned. The explanation is that in the night he had to send for the doctor, and his mind is worried because he fears that he may lose the child he loves.

Now, that is an instance, and a terrible one, of the influence of worry, fear, anxiety, and such things upon the body. We have definite proof that in such cases the whole of the digestive processes of the body cease, and nothing can start them. We cannot learn too soon that our duty to ourselves or to others in such cases is to obey Nature. If it is necessary that food be taken, and that often comes to be the case with, for instance, a mother who is nursing a sick child, then the really wise doctor will pay as much attention to the feeding of the mother as to the feeding of the patient, and he will feed her on food that has been already digested outside the body. And so he may thus save his little patient.

Shakespeare, who had such a wonderful knowledge of things, understood this, and he puts into the mouth of the king, when he dismisses Wolsey, some words to the effect that Wolsey is to read the paper the king hands him, which contains his dismissal, and then to go and eat his breakfast, *if he can.*

The tired brain that makes eating harmful for us

Now, there is another state of the brain in which it is unwise to eat, because digestion is made impossible. That state is tiredness, or fatigue. It has been proved that when a person is tired, this is mainly because certain poisons, which he has himself made, are in his blood. Perhaps they have been made in his muscles, for he may have been working hard with his limbs; but no matter where they have been made, these poisons are carried by his blood to his brain, and they produce in it the state which we call fatigue or tiredness. Now, such a brain cannot digest. It is possible to swallow various kinds of food when one is very tired, but the chances are high that they will only do harm. The remedy for fatigue is rest. A person who is desperately tired is not suffering from lack of food, he is not starved, which is quite a different thing; if he were starved, the remedy would be food, but the remedy for fatigue is rest. In a little time the body will get rid of these poisons, and then the man's appetite will return, and with it his power of digestion.

For several years past there has been in various parts of the world a sort of craze for long-distance racing. Now, our business here is the study of the body, and long-distance running is full of interesting lessons about the human body.

Running and games, and what they teach us about the body

It is, of course, an experiment, and one of a very interesting kind, because in some ways it is a very natural experiment. Running is a thing for which the body is well fitted in many ways, and the very fact that children are so fond of running about teaches us that we can probably learn something very useful about the human body from running.

It would be easy to write a long and interesting book about running and games and athletic sports, and what they teach us about the body and the mind of human beings. But here we want to speak only about the question we are discussing—that is, the effect of tiredness on digestion. We were all interested in the famous Marathon race that was run in London in 1908, because several countries were competing, including our own, and some of us were particularly interested because we expected that the different sets of runners would have different theories about how to take care of themselves during a 26-mile race on a hot day. Now, when

a man is running a race like that, for much honor and glory, he is to a certain extent worried and anxious, and in time, of course, the body becomes fatigued. Such a race is really a fatigue test. The man who becomes tired last reaches home first—apart from questions of judgment in running, and so on.

WHY WE SHOULD NOT EAT WHEN WE ARE TIRED

Now, those who study the body know that when there is both anxiety and fatigue, it is no time for eating. By all means drink water, which requires no digestion, and helps to flush the fatigue poisons out of the body, but do not let us make the absurd mistake of forcing ourselves to eat. The heart lies next to part of the stomach, and everything that disturbs the stomach will disturb the heart, and if the heart goes wrong there is an end to our running.

Well, now, what happened in the Marathon race? It is very interesting to know, because on the average the same thing will always happen, and must always happen. After inquiry, which has been made very carefully, because an experiment like this is of great importance for science, we find that the facts are that the first Englishman to reach the goal arrived some twenty minutes or so after the winner.

Now, the Englishmen took various kinds of food on the way. They do not study such things much in England, and if one told the average English runner some of the facts which science has discovered about his muscles and his heart and his lungs, upon which all his running depends, he would probably want to know how fast his advizer could run, and would think that he did not know what he was talking about. Now, a large number of the American runners arrived in the front, including the winner.

AN IMPORTANT TRUTH THAT MARATHON RUNNERS DID NOT UNDERSTAND

The American team took no food whatever during the race; the Italian runner also took no food, but he believed in the use of alcohol during a race, being ignorant of the fact that one always has to pay a heavy price and very quickly, too, for the apparent good one gets out of alcohol. He paid his price by collapsing before he got to the tape, and he afterwards did the same thing over here. When we take a meal, it is about four and a half to six hours on the average before the valuable part of the food is prepared and passed into the blood. Until it gets into the blood it is doing no work for us, but, on the contrary, we are working upon it. Now, a Marathon race takes about three hours or less. So we may say that the English team would begin to get some good out of the food they had taken about two hours after the race was over. In point of fact, it is more likely that, what with anxiety and fatigue, they would never get any good out of that food. During the race it lay undigested in their stomachs, and merely hampered the working of the heart, which is what a runner really runs with.

Now, long-distance running is only a sport, and by no means the best of sports, because it is selfish. But this ignorance of the truths about the body, which showed itself among the Englishmen in this race, shows itself also in a much bigger race which the British nation is running with the German nation and the American nation and the Japanese nation to-day.

THE KNOWLEDGE THAT HELPS, AND THE KNOWLEDGE THAT IS OF NO USE

Though we won the race, nevertheless, in spite of all we spend on education, we are not yet teaching ourselves or our children the great lessons of Nature—the mighty mother of all real wisdom. All over the country, not in single cases, but in millions of cases, we are doing more foolish things than the English runners who ate food that required twice as long to digest as the race took to run. All over the country, boys and girls are learning the names of the Roman emperors and the height of Mount Everest, and the name of the English king who died of eating too many lampreys, while their mouths are full of decaying teeth of which they never think, which they have never learned to use, for which no one does anything, and yet the happiness, the usefulness, and worth of their future lives largely depend upon these very teeth which are being allowed to decay while the boy or girl learns the names of many things which are not important.

Let us hope that, when we who are children, and who are reading this book, grow up, we shall understand that all

living creatures are parts of Nature; that there are no laws or facts of Nature which do not matter; that if we are to command Nature, and use her for our own human purposes, we must command her by obeying her, as Bacon said. We might think, perhaps, that lessons like these were not to be learned from such a humble thing as the stomach, but there is nothing in the world that is common or unclean, and, as Tennyson tells us, if we understand all there is to know about only the smallest flower, we shall know more about ourselves and about God.

We have now learned when not to eat, and why we should not eat then. It is to be added that when we have a cold, and often also in very hot weather, our appetite fails. It does this for a good reason, and we shall be wise to obey it. But there is another important point about when to eat. Our appetite cannot always foretell exactly how much we shall like. This is especially true with children, who often ask for a large helping, and then cannot eat it all. We ought to learn not to be greedy, and we ought to think twice before we force food down; it is very likely that it will not be digested, and sometimes, when people do this with foods that are really valuable, they simply gain a dislike for them, and that is a pity.

HOW THE BLOOD NEEDS FOOD AND CALLS TILL IT IS SATISFIED

When we come to study the appetite very carefully, we find that it is by no means entirely due to feelings from the stomach. The bottom reason of real hunger is the state of the blood. Now, we have already learned that it takes some hours for the food to pass into the blood. So a man may have swallowed quite enough food to satisfy his blood when it gets there, but until the food gets there the blood is still crying for more. This sort of thing happens every day, both to grown-up people and to children. They go on eating until they come to the very end of their appetite. If they were wiser, they would stop when they feel quite capable of going on, and still have a little appetite left. That feeling of hunger will pass away when the food reaches the blood.

Probably the reason why healthy people have more appetite than they really need in these days is that our ancestors, long ago, when men were wild, were not always sure where their next meal was coming from, and needed good appetites to deal with a meal when they got the chance. The case is very different now, when our meals come regularly, whether we need them or not. This has its good side, but it may also have its bad side, which we can study equally well in ourselves, or in the domestic animals for whom we make the same unnatural arrangement.

THE IMPORTANCE OF APPETITE AND WHY IT MUST BE CONTROLLED

Now, we have been saying a great deal about appetite, but not a word too much. The appetites of human beings, for all sorts of things and not only for food, are among the most important things about us. It is mainly these various appetites that make us do things at all, rightly or wrongly, and the great defect of most that is written or taught about food is that the appetite is forgotten or misunderstood. Now we must go on to study some special foods, never forgetting that milk and bread have their own special precious place with which other foods cannot compete, and that therefore we have learned about them first, and must never forget about them. Let us first make a note about some of the foods that cost more than they are worth. That, of course, is true of a great many foods, but many of them we know to be luxuries, and make no mistake about them. There are others, however, which are dear in proportion to their worth, and yet have a really high reputation as foods.

First of all, let us take fish, and let us notice that the difference in price between, say, cod and salmon, and in general, between one kind of fish and another, is entirely a matter of flavor. As long as fish is fresh, or properly salted or smoked, it matters little what fish we are eating. Everything considered, even including the question of flavor, the herring must take the first place among all the fishes that mankind uses.

THE KINDS OF FISH THAT ARE BEST FOR FOOD

It must not, of course, be supposed that other fish are not good also, but the herring beats them all on the score of price; it is very digestible, and has a very good flavor. Different kinds of fish vary in the amount of fat they contain, and, as a rule, the less fat,

the more digestible they are. Cod, whiting, and haddock contain least fat of all. But, of course, fat is very good if one can digest it. No more need be said about this here. Simply we are to remember that whenever we pay more for a given weight of fish than we have to pay for that weight of the cheap fishes, we are merely spending money for a nice taste.

THINGS THAT ARE GOOD FOR INVALIDS, BUT BAD FOR HEALTHY PEOPLE

Healthy people, also, are almost throwing their money away when they take meat extracts. Taken with hot water, these things have a stimulating action, though probably not very much more than the hot water itself has. But, as Baron Liebig himself said many years ago, they are not foods. For people who are ill, and whose appetite is also ill, meat extract and beef-tea are often useful, because they help the appetite; but it is a great mistake to give these things to children, who ought to need neither stimulants nor fillips to the appetite. If we were really meant to require mustard and pepper, and so on, Nature would not have forgotten things of that kind when she made her food, which is milk.

When meat extracts are made, the substance of the muscle fibres is left behind. This substance can be prepared and made into a meat juice, and so on, and is a true food, though very expensive. But the stuff that goes into the meat extract contains very little food of any kind. If we make experiments on animals, we find that animals fed on beef extract die of starvation as quickly as animals that are not fed at all. That is a cruel experiment, but whether or not men were justified in making it, that is the result of it. The secret of the success of meat extracts and the public faith in them is that they get out of the muscle fibre everything that has a taste —everything, indeed, except the food itself, and it is the taste that cheats us.

THE COST OF FOOD IS NOT REALLY ACCORDING TO ITS VALUE

Cocoa is a food for which some good may be said; it helps many people to drink milk, but we ought to regard it as highly expensive, as it really is, in proportion to the food material it actually contains. We must discuss its properties later. In studying the cost of food in proportion to its food-value, we should always be ready to assume that directly the price begins to go up, we are paying, not for food, but for flavor. The products of wheat-flour and of oatmeal ought to rank as the standard for cheapness. We know their splendid food-value. In the same way, in places near the sea the cod or herring ought to rank as the standard. When we pay more than these fish cost, either for other kinds of fish or for meat, or for game or for poultry, we are paying for flavor. This is not to say that we ought not to pay for flavor, but it is simply stating a scientific fact that everybody ought to know.

It is a very important matter, from the national point of view, that when we put taxes on articles, or when we take them off, we should know what those articles are worth for the life of the people. For instance, everyone agrees that it is right to tax alcohol highly, because it is not a necessary of life. It may or may not be right to tax wheat, but at least we ought to know what we are doing. To-day many nations place substantial taxes on alcohol, tobacco, tea, and coffee, and these are often described as taxes on food. This is a very serious error, for none of these things can be said to have food-value.

TEA AND COFFEE AND OTHER THINGS THAT ARE NOT REAL FOODS

Though they are not foods, yet alcohol, tobacco, tea, and coffee are extremely important things in the life of a nation, for it consumes gigantic quantities of all of them, and every one of them stands for powerful chemical substances with various kinds of effects upon the body; some which we must call good, others bad, and others, so far as we can find out, neither good nor bad. We shall have to study these things very soon, but before that we must learn some more about the real foods, beginning with meat, of which we also consume large quantities, and about which there is a great deal that we ought to know.

At the zoos we find animals that will not eat anything but meat, and others that will not touch it. Yet in both cases the animals may be healthy and strong, so that eating meat is not a matter of life and death, as some people seem to fancy. Still, this is a very important question, as we shall see—if for no other reason than that meat is a dear food.

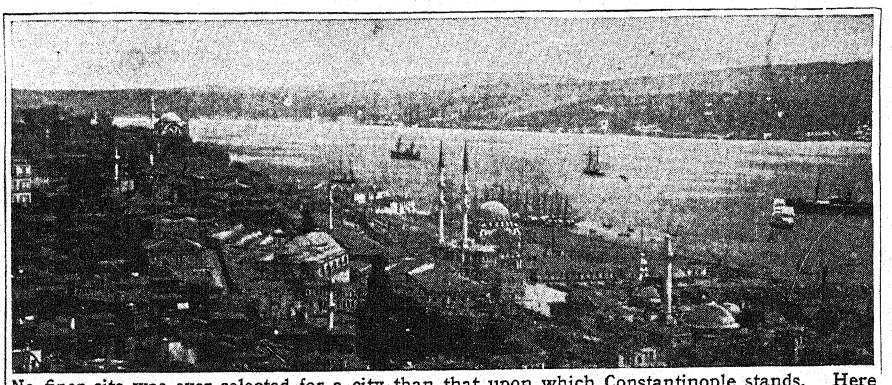
THE NEXT PART OF THIS IS ON PAGE 3271.

TURKEY AND THE BALKAN STATES



This map shows a part of the world that has been well described as "the cockpit of Europe," for right down the ages it has been, like the pits where game-cocks used to fight their battles, a constant scene of dispute and warfare. The map represents the boundaries before the revolt against Turkey in 1912, by which the territory of that power was much reduced. A final division of the conquered territory has not yet been made.

The top picture on page 3187 is by E. Armitage, R.A., and hangs in the Walker Art Gallery, Liverpool, and the picture of the Empress Theodora on page 3189 is by Val Prinsep, R.A., and is reproduced here by permission of Mrs. Sholto Vere Hare, the owner.



No finer site was ever selected for a city than that upon which Constantinople stands. Here we are looking from the city across the Golden Horn, the crescent-shaped arm of the Bosphorus.

THE BALKAN PENINSULA

THE RISE AND DECLINE OF TURKEY

CONTINUED FROM 3086



MOHAMMED II

THE Balkan Peninsula is washed by four seas. There is the Adriatic, the Archipelago, or sea of many islands, the Sea of Marmora, and the Black Sea. Two narrow straits, called the Dardanelles and the Bosphorus, connect the Sea of Marmora with the Sea of Many Islands and the Black Sea.

Most of this long coast-line, like that of Italy, is very beautiful; so are the "many islands" that surround it. We find the same deliciously warm, sunny climate, the same lovely bays with white or yellow sands, the same green hills or bare rocks running down to the intensely blue sea, the same exquisite veil of shining haze, fit robe for a country whose early legends and history are the most mysteriously beautiful and wonderful in the world.

But in the Balkan Peninsula we have no story, as we had in Italy, of various separate states which at last were fused into one nation. The relief of the peninsula will partly show us why. Rugged highlands cover much of its surface, the chief ranges being the sheltering Balkans, which give their name to the peninsula, and stretch across it, south of the Danube, east and west. The height of these mountains varies from 2,000 to 8,000 feet. The highest are, therefore, above our own Alleghenies. Many other ranges branch off in different directions; the Pindus chain, striking southward, forms a sort of backbone in the narrower part of the peninsula. There are several large plains, the chief being the great plain of the Lower Danube. South of the Balkans is the plain drained by the Maritza river; and the plain of Thessaly lies east of the Pindus range. These, and many smaller plains, are much isolated and cut off from each other by the far-reaching mountains, across which it has been very difficult to make good roads.

Another chief reason why the different states which were gradually formed in these plains and on the hillsides have never really united is that the peoples who have settled and ruled in them belong to quite different races, with different speech, and, to some extent, different religion.

Twice in the centuries since the birth of Christ there has been a ruling power in the peninsula strong enough to keep for a time the various states more or less under its control and leadership. But an unconquerable

desire for independence has led to grim and tragic warfare all through the years. Consequently, as we look at the map of this part of Europe as it is to-day, we have to remember that every mile of the wavy border lines that part the various countries have been fought for, lost and regained, amid scenes of incredible cruelty, and some of those lines are even to-day not permanent.

GREECE, A FAMOUS LAND SHAPED LIKE A MULBERRY LEAF

Let us start at the southern end of the peninsula, the Morea, shaped like a mulberry leaf, the stalk that joins it to the mainland being the Isthmus of Corinth, which is now cut by a canal. The Morea, with the provinces to the north of it, which now include part of Macedonia and the peninsula of Salonika, and many fairy-like islands, make up the far-famed country of Greece. We read of its heroes and its legends, its marvels and earliest history, in another part of our book; they all belong to its period of greatest glory in the times before the birth of Christ. This small country, especially the division of it called Attica, half the size of Long Island, with its famous city, Athens, has influenced the lives and thoughts of countless people for more than two thousand years.

We will take up its story when its most brilliant days were past, when it had been conquered, with other Greek-speaking provinces round the Sea of Many Islands, by the masterful Romans.

In the middle of the fourth century, Constantine, the Christian emperor, selected as his capital Byzantium, situated on the point where the rushing Bosphorus widens into the Sea of Marmora. A fine situation, thought the emperor: Asia in sight across the straits, a splendid harbor—the Golden Horn, we call it now—running seven miles inland.

HOW CONSTANTINE BUILT THE NEW ROME IN FULL SIGHT OF ASIA

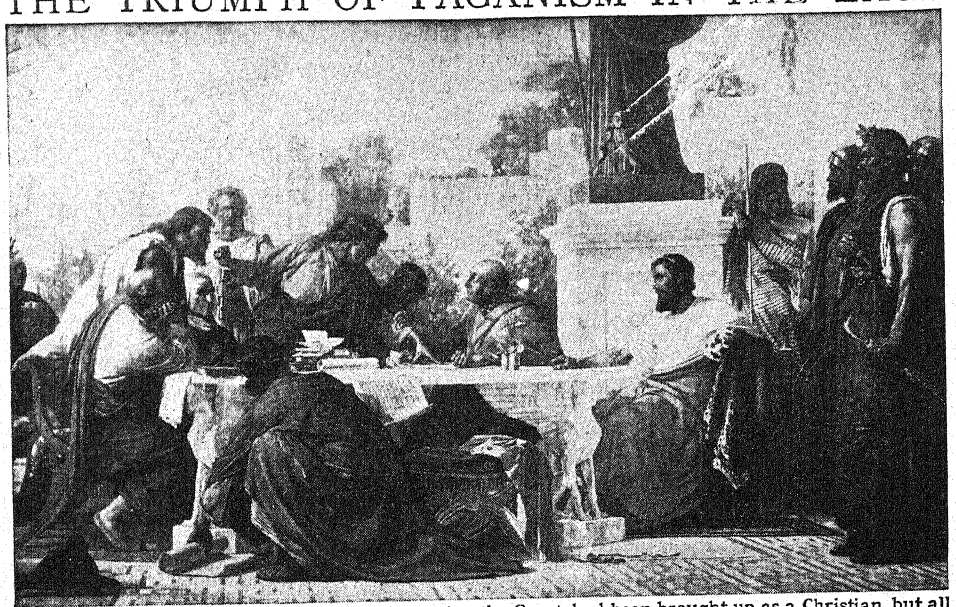
And so he added to the city, built walls to defend it, and called it New Rome. But the name it has always borne is Constantinople—the city of Constantine—and it soon became the capital of the Eastern or Greek Empire, also called the Byzantine Empire. We see in the story of Italy how the great Roman Empire became weak, and how it split into two divisions, East and West, at the end of the fourth century. Unhappily, differences arose between the Churches of the East and West, and so it came to pass that as Christianity spread over Europe in the centuries when the formerly wild peoples were settling down, these peoples joined either the Western Church, with the Pope as head, or the Eastern Church, ruled by the Patriarch of Constantinople. We have seen already that the English, French, Germans, were converted by missionaries from Rome. But the Slavonic peoples, and others of different stock who became very much mixed up with the Slavs, settling, as they did, about the Balkans and the Danube from the sixth century onwards, had more to do with the Eastern Empire, and so took their Christianity from the Eastern or Greek Church. Chief among these peoples were some whose names appear on our modern maps—the Bulgars, who settled between the Danube and the Balkans, and whose kingdom now reaches over the southern slopes of the mountains; and the Serbs, who settled to the west of them, in Serbia, and other smaller states near the Adriatic. Many and sore were the struggles between the Eastern emperors and these settlers on the northern boundaries of their dominions.

THE PEOPLE OF THE MOUNTAINS AND THE BUILDERS UP OF KINGDOMS

Let us look a little closer at the land on these northern boundaries. Then, as now, the noble Danube in its middle course rolled on full of water from the distant Alps and Carpathians, forming a splendid waterway from the plain of Hungary to the Black Sea. Then, as now, well-watered, fertile plains lay on each side of the river, shut in by the Hungarian mountains on the north and the Balkans in the south. The northern plain, with its sheltering slopes, became settled by people whose lands later became partly independent states, called Moldavia and Wallachia.

In the picturesque mountain country between the Black Sea and the Adriatic, a perfect ferment of peoples settled and fought and struggled with each other and with their neighbors, into whose hands they fell ever and again as the years rolled on. The kingdoms of the Bulgarians and Serbians were particularly large and important, and towns and monasteries rose up among the mountains in the sunny valleys. Bosnia, too,

THE TRIUMPH OF PAGANISM IN THE EAST



The Roman Emperor Julian, nephew of Constantine the Great, had been brought up as a Christian, but all the time he secretly admired the heathen gods of Greece and Rome, and when he became emperor he tried to restore pagan worship. Because of this, he has been known in history as Julian the Apostate. He tried to win the Christians over to paganism by flattery and favor, and here we see him addressing a conference of Christians. It is said that on his death-bed Julian exclaimed, "Thou hast conquered, O Galilean!"



The wonderful mosque of St. Sophia, at Constantinople, of which we see the interior in this picture, was built as a Christian church, by the Emperor Justinian the Great. It is the world's finest example of Byzantine architecture. When the Turks took Constantinople they turned it into a mosque, and so what had once been the most beautiful Christian church became the most magnificent sanctuary of the Moslem world. Round the walls may be seen large circular plaques bearing texts from the Koran.

managed to keep itself distinct, and to develop into a kingdom.

About the middle of the sixth century the names of three great men stand out—the heroic General Belisarius, the Emperor Justinian the Great, and the writer Procopius, who gives such a full account of their doings. Two great deeds of Justinian's were the revision of the old Roman law and the building of the noble cathedral of St. Sophia at Constantinople. By bringing the stern old laws of the empire more into harmony with the gentler religion of Christ, Justinian did much good for his own times; but not only that, so well and thoroughly was the work done that this revision of his has ever since been of the greatest value to those who are starting the study of law. With regard to his other chief work, the cathedral of St. Sophia had been twice burned down.

THE BUILDING OF THE WONDERFUL CHURCH OF ST. SOPHIA 1,400 YEARS AGO

Within forty days of the second disaster, Justinian began to build the magnificent place of worship we can see to-day. Its shape is that of a Greek cross—the four arms of equal length—with a vast dome in the centre. Procopius speaks of the glorious colors of the marble pillars—taken from the old temples of Asia—green and purple, glowing red and glittering white; the bright sunshine from the many windows of the dome falling on beautiful mosaics and gorgeous gilding, and on a wealth of gold and silver plate and precious gems. Such was St. Sophia 1,400 years ago.

About half a century after Justinian, the Emperor Heraclius fought many campaigns against the Persians, far away on the banks of the Euphrates, in Asia; and the cause of the war was this: In Jerusalem—the city so sacred to Christians, and at that time part of the emperor's dominions—there was treasured up a piece of wood, believed to be part of the Cross. The Persians, who had long been encroaching on the emperor's borders, came and took this piece of holy wood away. Heraclius, after much fighting, succeeded in getting it back from the Persians, and, returning to Constantinople, he laid it before the altar of St. Sophia, before restoring it to its shrine in Jerusalem.

About fifty years before the Persian war a strong man, belonging to an Arab tribe, was born at Mecca, and brought up by his uncle. He was a reformer, for he taught the Arabs, or Saracens, to give up idolatry, and to form themselves into one nation.

MOHAMMED'S LETTER TO THE KINGS OF THE EARTH, AND THE PERSIAN KING'S REPLY

His new religion taught that there is but one God; that both the Jewish and Christian religions had come from God, but that he, Mohammed, was sent to teach a more perfect faith still, and to force it upon the whole world. Mohammed sent a sort of circular letter to the kings of the earth calling upon them to embrace this faith. The Persian king answered that he would put the prophet in chains when he had time; Heraclius made no direct reply, but sent some small presents.

It is almost impossible for us to realize the force and fury with which the followers of Mohammed set forth to conquer the world to their faith by the sword. They not only did not fear death, but wanted to be killed if only they had slain an "unbeliever" first. For they firmly believed they would then be safe and sure of perfect happiness in the world to come.

It was this fierce spirit in the Saracens—for so they were called as they spread, conquering, far and near—that caused them to be so greatly dreaded. Province after province in Asia fell to them, including Jerusalem, and the holy wood was hastily taken back to St. Sophia. The magnificent walls of Constantinople saved it for another three centuries, but nearly all the time the emperors of the East were engaged in fighting the followers of the prophet.

THE TWO BRANCHES OF THE CHRISTIAN CHURCH BREAK APART

During these years the two branches of the Christian Church were ever drifting wider apart. Latin ceased to be a common tongue, and the Roman element became less and less strong. The Greek language and literature were more widely cultivated, and many scholars were at work in monasteries and schools, often in remote spots out of the way of the turmoil of incessant war. For, besides the struggle with the Mohammedan Saracens and Turks, who followed them, the empire

SOME FAMOUS RULERS OF BYZANTIUM



Legend says that, being blind and poor, Belisarius, a great Byzantine general, wandered about with a guide, and the youth being killed by a snake, Belisarius carried the body, not realising he was dead.



The emperor whom Belisarius served was Justinian the Great, who married a dancer named Theodora. Theodora was beautiful, but although wise and courageous, she was also arrogant and cruel.



Desiring a wife, the Emperor is said to have called the most beautiful maidens to his palace, and with a golden apple to give to the lady of his choice, he chose Casia, but by a pert reply to a remark of the emperor she offended him, and passing on he chose Theodora for empress, giving her the apple.

was beset with wild tribes pressing in from the north. Such were the Russians, who united in a single horde about the middle of the ninth century, and worked their way to the Black Sea. They made raids on the Bosphorus, and ravaged Bulgaria.

To make matters worse, there were a great many feeble and wicked emperors, stone-blind to the pressing needs of their times, who allowed their great inheritance to slip out of their weak and idle hands. Occasionally a strong man arose, such as Basil II., in the same century that saw the Norman conquest of England. Basil managed to subdue a strong compact against him formed by Bulgaria and Serbia inland, and Macedonia by the sea. His cruelty was horrible, and gained him the name of the "Slayer of the Bulgarians." He moved back the border of the empire to the Danube; but his successors were weak and unworthy, and quite unable to resist the onward rush of the Seljouk Turks from the East, who, having become Mohammedans, gained Asia Minor and Jerusalem.

THE DESTRUCTION OF CONSTANTINOPLE AND THE SCATTERING OF ITS TREASURES

To this day pilgrims make their way, often on foot, from all the countries round, to visit the sacred shrines in the Holy City, and it was the tales of the bad treatment of the pilgrims long ago that roused Europe to start the Crusades.

The Fourth Crusade, headed by Baldwin of Flanders, fell very far short of the high aims with which these "Holy Wars" began. Detained for a while at Venice while waiting for ships to carry them eastwards, the Crusaders were persuaded to take up the private quarrels of the Venetians, and in the end they helped them to besiege Constantinople. The city was taken on the second attack, and the inhabitants were treated with terrible cruelty; their beautiful city was sacked, and the art treasures that Constantine and his successors had gathered together were ruined. To make paltry coins, the most beautiful bronze statues the world has ever seen were cast into the melting-pot. So "Christians" of the West treated Constantinople of the East.

Baldwin was elected emperor; but his rule was not for long. The Venetians and the Genoese, bent on enriching themselves by trade, shared various islands and ports between them. The large island of Crete, with its steep mountains dark with evergreen foliage and its smiling valleys, fell for a time to Venice.

During the last century of the existence of the once mighty but now dying empire, its great destroyers, the Ottoman Turks, or Osmanli, under their crescent banner, were gradually carving their way to the heart of the empire, Constantinople. The Asiatic provinces, the chief islands and ports, fell one by one, and still on they came.

THE MARCH OF THE TURKS INTO EUROPE, AND THE DOOM OF THE QUARRELERS

The story of how the Turkish Crown Prince with eighty followers crossed into Europe on rafts is most thrilling. At the narrowest part of the Dardanelles —no wider than a good-sized river— they succeeded in gaining a fort, the first foothold of the Ottoman Turks in Europe. Before many years had passed, towns, villages, valleys, all fell to the conquerors—even Adrianople, the second city of the empire, situated in a beautiful and fertile valley. There were several causes which helped on the Osmanli besides their own daring and power in arranging the best ways to fight. The rulers of the old empire were weak and foolish; the Balkan Christians were fiercely destroying each other while the hour of their doom was coming nearer; and the other Christian peoples around, the Venetians, Genoese, Hungarians, Poles, Austrians, were too disunited, too busy with their own affairs, to join heart and soul against the powerful invaders at their gates.

BOYS OF CONQUERED PEOPLES DRILLED TO FIGHT AGAINST THEIR COUNTRIES

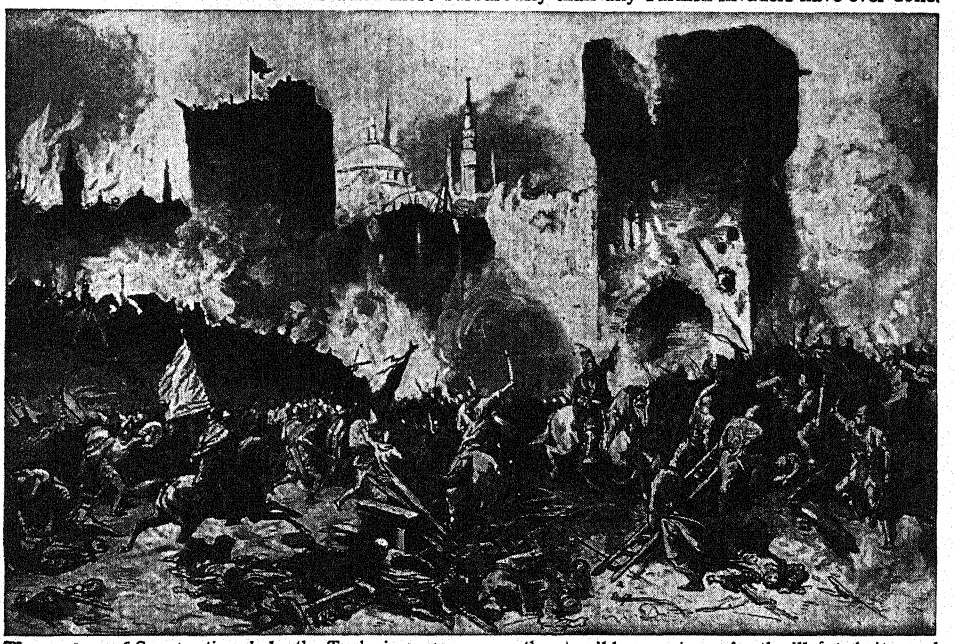
Sigismund of Hungary headed a force when the Turks burst through the Balkans; but they were too strong for him, and, afterwards, he was much taken up with persecuting John Huss, who was later put to death, and his followers. Later, the brave Hunyadi, with the Poles, defeated the Turks, but was afterwards in his turn defeated at that bloody battle of Kossovo.

Constantinople in these days was more and more becoming a city-state instead of the heart of a once mighty empire, and the Turks were more and more determined to have it for their

THE DOWNFALL OF CONSTANTINOPLE



Few cities have been besieged and taken so many times as Constantinople. Since the middle of the sixth century it has undergone twenty-six sieges and has been captured eight times. But its most terrible experience was in 1204, when it was taken by the Crusaders. The city was given up to pillage; and the so-called Christian warriors acted more barbarously than any Turkish invaders have ever done.



The capture of Constantinople by the Turks in 1453 was another terrible experience for the ill-fated city, and about 60,000 men, women, and children were made slaves, and dispersed through the Turkish Empire. But the fall of Constantinople was not only an ordinary historical event, or the triumph of Crescent over Cross; it had more far-reaching effects than any other event in modern history, for by driving scholars with their books into Italy from the East, it helped the great revival of learning, and this led to the Reformation.

capital; so all the time they were increasing their ships and their army. One way of increasing the strength of the army was to make the conquered Christian peoples give up the finest of their boys. These boys were brought up as Mohammedans, and drilled to fight against the countries which had given them birth. These troops were the famous Janissaries, or new soldiers, who helped so largely to destroy the Eastern Empire, and who, later, gained so much power over the sultans.

THE TAKING OF CONSTANTINOPLE, AND THE LAST CHRISTIAN SERVICE IN ST. SOPHIA

The ruins of the thick walls of Constantine's city show how strong were the defences when Constantine XI., the last emperor, stood bravely in the breach against Mohammed II. He knew the end was near, and at midnight had taken the Sacrament in the beautiful church of St. Sophia. Then, after a short rest in his ruined palace, he sadly mounted his horse and rode away amid the sobs of the crowd to the post of danger. Before long the besiegers made their entrance over his dead body. The streets were deserted, for the people had gathered in St. Sophia in frantic prayer, expecting a miracle to save them. Alas! a piteous wailing went up as they were dragged out to be killed or sent to slavery, and then, only a few hours after the celebration of Constantine's last act of Christian worship, the loud voice of the Mohammedan crier rang out through the huge building: "God is great, and Mohammed is His prophet." This was on May 29, 1453.

St. Sophia still stands in its grandeur, and many of its beautiful mosaics still tell of its Christian past, though for more than four centuries it has been used as a Mohammedan mosque.

THE FLIGHT OF THE LEARNED MEN, AND THE BIRTH OF THE NEW LEARNING

This conquest by the Turks of the old Greek Empire, and particularly that of Constantinople, caused the flight of many students and learned men, with the manuscripts they so much loved, towards the West, chiefly to Italy. In Florence, Lorenzo the Magnificent gathered round him men who were interested in the old Greek manuscripts and in the wonderful old Greek art. The knowledge of these writings and of this art had been shut up so long in the East that when the study of them was revived it was called the New Learning, and the New Birth of Art. Many scholars from all over Europe journeyed to Italy in those days, and returned to their own countries to fire others with enthusiasm for the study of Greek and its wonderful literature. "I have given my whole soul to Greek learning," writes Erasmus, the friend of More and Colet, from Paris, "and as soon as I get any money I shall buy Greek books—and then I shall buy some clothes."

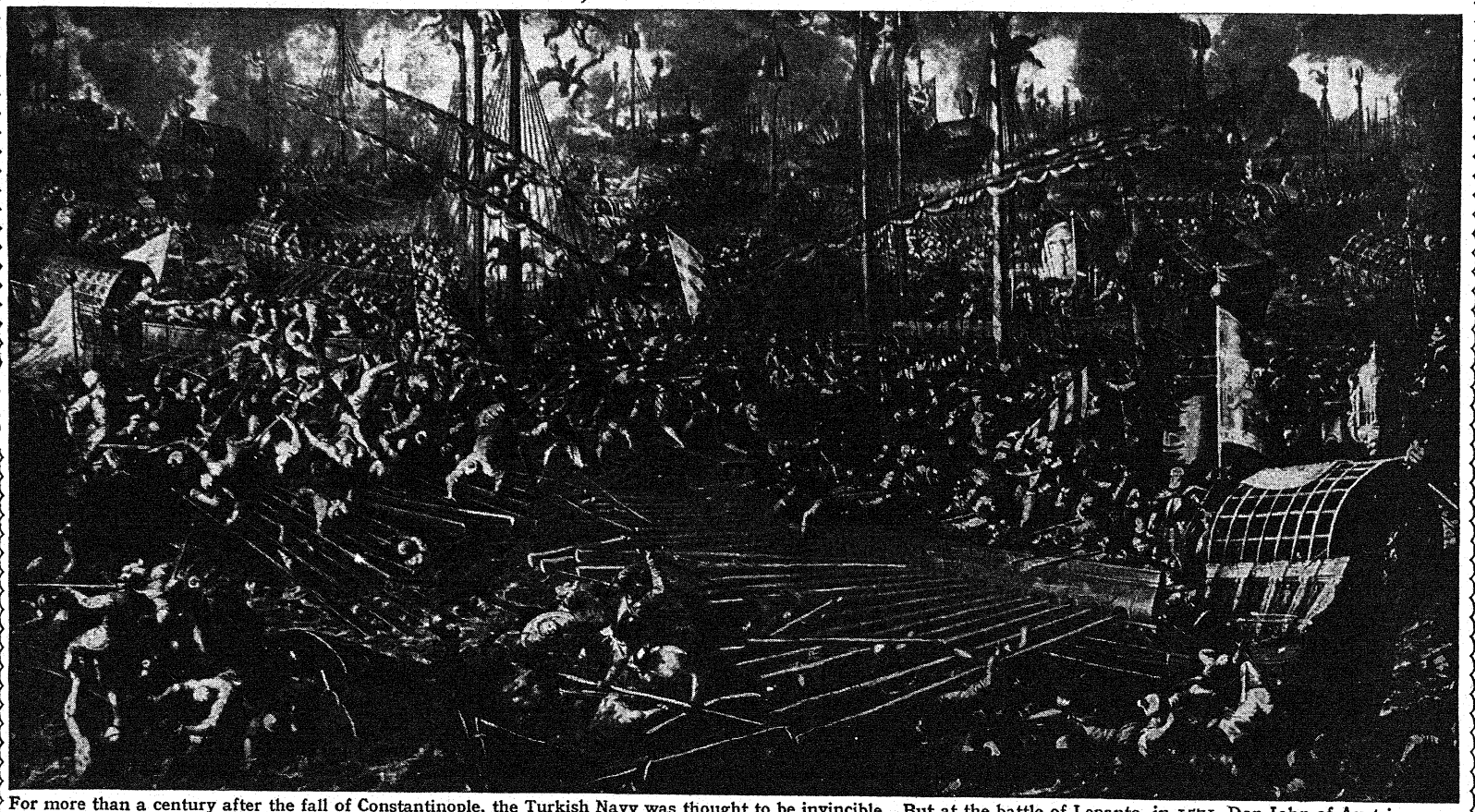
During the years that followed the taking of Constantinople, the crescent on the Ottoman banner shone triumphantly over an immense and powerful empire from the Danube to the Euphrates, from the Caspian Sea to the Straits of Gibraltar. The discipline and unity of purpose of the Mohammedans prevailed against the jealousies and quarrels of the Christian kingdoms. Deeds of daring and heroic resistance on their part were not wanting, and there were terrible revolts and massacres; but so bitter were the jealousies between Christian rulers, so intense the hatred between the East and West branches of the Church, and between Catholics and Protestants, that not only was there no united front against the followers of Mohammed, but on several occasions Christians sought alliance with them against their fellow Christians.

THE SULTANS OF TURKEY, AND THE MAGNIFICENCE OF SULEIMAN THE GRAND

Among the Turkish rulers—who came to be called sultans—were many strong and clever men. One of the greatest was Mohammed II., who had ridden over Constantine's body and up the nave of St. Sophia on that eventful day in May, 1453. He ruled for thirty years, and conquered Serbia, Bosnia, and Greece.

Suleiman the Magnificent lived at the same time as the trio of Western kings, Henry VIII. of England, Francis I. of France, and Charles V. of Germany. An old German song shows the terror which this "Grand Turk" cast over the Holy Roman Empire. It says: "The furious Turk has lately brought great forces into Hungary; from Hungary he has quickly entered Austria in the light of day; Bavaria is his for the taking, thence he presses onward and may soon come to the Rhine, for

THE BATTLE OF LEPANTO, WHERE TURKEY LOST HER SEA-POWER



For more than a century after the fall of Constantinople, the Turkish Navy was thought to be invincible. But at the battle of Lepanto, in 1571, Don John of Austria, a son of the Emperor Charles V., routed the Turkish fleet, Turkey lost control of the sea, and her conquering progress in the West was stopped. The Turkish fleet consisted of 277 ships and 120,000 men. The Christian forces were made up of the fleets of Venice, Spain, the Pope, and the Knights of Malta, but it was Don John's skill that won the day.

which cause we have no peace or rest." It was said of Suleiman that while he ruled, sword and pen were never dry, so continually was he fighting, and so great was the number of writers in his day. It was he who swore he would take no rest till the prayer of the prophet rang out from the tower of St. Stephen's Church, in Vienna. But his quarter of a million Turks were obliged to retire from the gallant city, and so the spread of the Turkish power in the valley of the Danube was checked for a while.

A LONG LINE OF WEAK AND CRUEL RULERS OF THE CONQUERING TURKS

A few years after Suleiman's death, at the great naval battle of Lepanto, a limit, too, was set to Turkish power in the Mediterranean and upon the sea generally.

After this came a succession of weak and cruel rulers, and under them there were wars with the Persians, mutinies of the Janissaries, who had become a very rich and strong body, and other disasters. Ottoman power rose again for a time under the able rule of a family named Kiuprili, many of whom acted as prime ministers, or chief viziers. It was under one of the family that the Turks determined to try their fortune again at Vienna. Enormous preparations were made, and alliances renewed with most of the surrounding nations, so that the emperor should be left without help.

The vast hosts advanced, spreading terror and desolation in their way. Then they encamped before Vienna. The peasants had crowded into the city from the country round. There was but a small garrison, the old walls were out of repair, and the Turks, the best engineers and artillerymen in Europe, soon undermined them and drove off the emperor's soldiers.

THE STEADY EBBING OF THE TURKISH POWER IN EUROPE

At last, after two terrible months, when it seemed only a question of days before the Turkish general would gain the glory of receiving the submission of the devoted city, a troop of Poles was seen hastening down the vine-clad slopes, shouting " Sobieski for ever ! "

The terror of the name of this gallant King of Poland, who had inflicted such terrible defeats on them before, filled the Turks with a panic, and they fled on all sides, leaving immense treasure behind them. The siege was raised, and the Turks were driven out of Austria. There is a picture on page 2894 showing the victorious Poles after the scattering of the Turkish camp.

Since this September day in 1683 the tide of Turkish power in Europe has steadily ebbed. No more did the sultans threaten and terrify the whole world, though they still had some successes, and continued for many years to keep in wretched bondage and misery the Christian nations of the Balkan Peninsula.

The Turks were driven out of Hungary; many towns and islands in the Mediterranean were taken from them; the Morea passed for a time to the Venetians before entering on its long final struggle for freedom against the Turks. The Russians, now growing into a Power in Europe, captured Azov, on the Black Sea, and by degrees its northern shore passed into their hands. Ships on the Black Sea meant power to threaten Constantinople, and much influence in all the four seas that wash the shores of the various Balkan countries.

THE GREAT CHANGES THAT CAME WITH THE GROWTH OF RUSSIA'S POWER

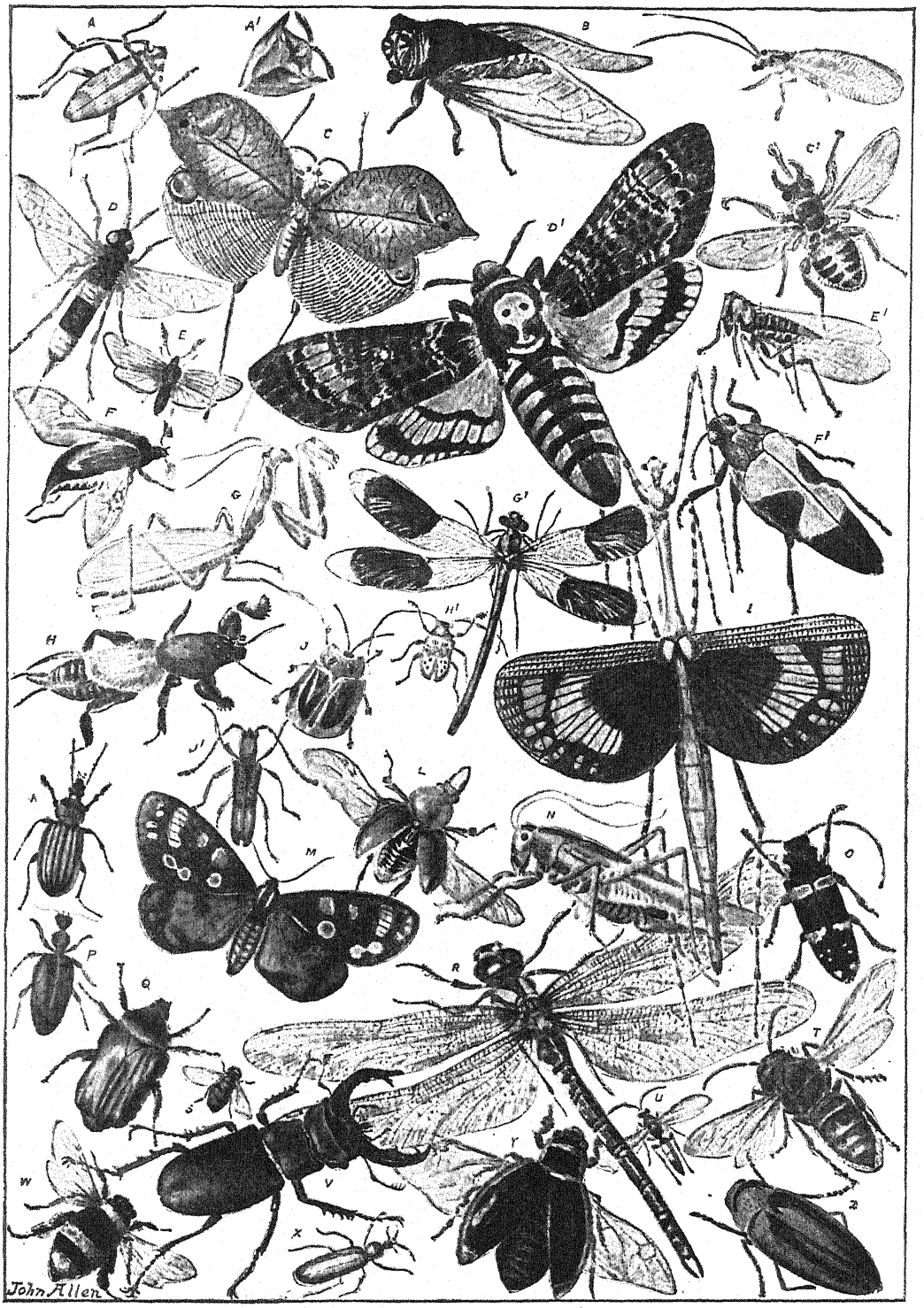
With the growth of Russia's power came the right to interfere in the provinces north of the Danube, particularly Moldavia and Wallachia, which were dependent on Turkey. This country's frontier fell back to the Dniester, then to the Pruth, and for many years the old kingdoms were alternately under Russia and Turkey.

The growth of Russia had a great effect in restoring to power the Eastern or Greek Church. It had years of depression while it was the religion only of the oppressed and ever-rebelling subjects of the sultan, and of the Russians, who were few in number. But as the Church of a chief Power in Europe, it bound that Power in sympathy with its poorer brethren of the smaller and despised nationalities, and gave many chances of encouraging their revolts.

How these revolts helped to bring freedom, and how they failed, we read in the next STORY OF COUNTRIES, where also we read the amazing story of Turkey's efforts to set herself free.

THE NEXT STORY OF COUNTRIES IS ON 3239.

SOME INSECTS IN THEIR NATURAL COLORS

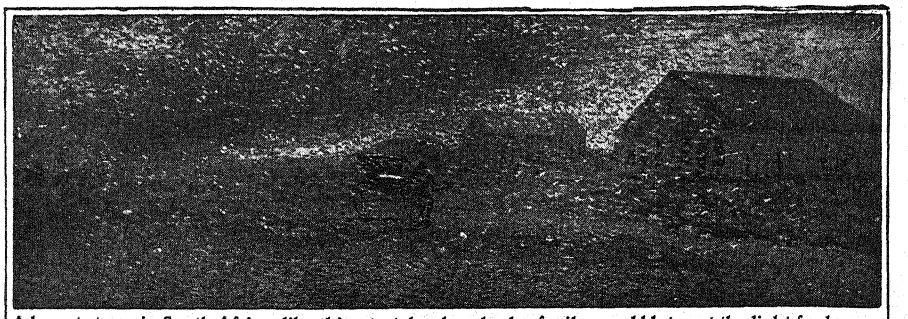


In no department of animal life do we find such myriad forms as in the insect world. It is estimated that there are over a million different kinds of insects, more than all other varieties of living creatures together. On this page we see a few insects, some of which have no English names.

A. Arm-cheeked beetle
A1. Perforated tortoise beetle
B. Plant bug
B1. Lace-wing fly
C. Eyed leaf-insect
C1. Tsetse fly
D. Giant wood wasp
D1. Death's-head moth
E. Irish burnet moth
E1. Lantern fly
F. Cockchafer
F1. Chrysochroa
G. Praying mantis
G1. Demoiselle dragon-fly
H. Mole cricket
H1. Yellow longhorn beetle
I. Winged stick insect
J. Chinese tortoise beetle
J1. Australian longhorn beetle
K. Carabus ulens
L. Golden lamprinia
M. Scarlet tiger moth
N. Great green grasshopper
O. Countess beetle
P. Walking anthicus
Q. Rose-chafer
R. Great dragon-fly
S. Greenbottle fly
T. Hornet
U. Ichneumon fly
V. Stag beetle
W. Bumble bee
X. Cerocoma schaefferi
Y. Great water beetle
Z. Serricornia sternicornis

The word insect means "cut into," and the name is given to these creatures because their body is so distinctly divided into three parts—the head, chest, and abdomen. Insects have wonderful organs of sight and smell. The cockchafer, for example, has 39,000 separate organs of scent.





A locust storm in South Africa, like this, stretches hundreds of miles, and blots out the light for hours.

SOME INSECT FOES OF MAN

CONTINUED FROM 3062



FEW of us imagine how important a part in the history of the world little insects play. Next to the poisonous snakes, they are really more to be dreaded than any other form of animal life. There is nothing else living that does so much damage to property. A lion or a tiger is more terrible to face than a mosquito, but the innocent-looking mosquito may cause death as surely as the fearful man-eater. Animals are big and comparatively few; insects are little, but their numbers are by no means small, they are more than men can count, and the insects are not discovered until the damage is done.

How a plague of insects begins it is not always easy to say. But we know how one began, and we may gain an idea from that as to what happens in other places. Up to about half a century ago the gipsy moth was unknown in Massachusetts. But then an unfortunate thing happened. A gentleman was carrying on experiments in his laboratory with the window open, when a gust of wind carried out into the garden a few gipsy moths that had been sent to his home in Massachusetts.

These laid eggs which hatched, and the caterpillars became moths which laid many more eggs. So rapidly did they increase that within a few years the gipsy moths had spread over an area of many miles. Men tried in vain to fight against the plague. The caterpillars swarmed over the trees and ate them bare, as if a fire had swept over the land. Over 40,000,000 trees were raided again and again in this way. The Government of the state spent as much as $90,000 a year for many years in succession, but still the plague continues, and Massachusetts is robbed of much wealth by this pest.

The Colorado beetle is another dreaded enemy of the farmer. It is rather a handsome little beetle, with its orange-colored, black-spotted coat, but it completely ruins the potato crop wherever it gets a hold. Until recent times it existed only on wild plants, but then it got among the potato fields of Colorado. The mother beetle lays hundreds of eggs on the leaves of the potato plant. The young ones hatch very quickly and lay eggs in turn, and the young ones from these then lay eggs—all this in one summer. During the winter they go to sleep in the ground, but wake up in the spring, and attack the plants so that in some places the potato crops are completely destroyed. Any person found with living specimens in his possession is heavily fined. This pest is dreaded all over the country.

We all know the cuckoo-spit, or froth-fly, or frog-hopper, or froth-hopper, or frog-spit—it has all these names in different parts of the country. It is the insect which lives on stems of grass and many other growths. There are many varieties of it. It sucks the juice of the plant or

growth upon which it lives, and forms a dwelling of froth, supposed by many people to be little bubbles blown by the cuckoo. If we remove the froth we find a little animal inside, a yellowish-green insect with long hind legs, with which it can hop like a frog. A little girl discovered one of these insects by making the sun shine through a magnifying glass upon the froth. Out pounced the froth-fly, looking as surprised and angry as an insect can look.

Now, the frog-hopper serves to introduce us to one of his most dangerous relatives, the cicada, which, though known in Europe, is most deadly in America, where we name it the "seventeen-year" locust. This title is given it because it appears as a pest once every seventeen years. What happens is this: The male flies of the perfect cicada die soon after their wedding day; but the female fly lays about 500 eggs in the twigs of the tree upon which it settles, and then dies. But before it dies it inflicts damage upon the tree. The eggs lie in the warmth and hatch, and the grubs, as soon as they are born, fall to the ground, and make their way into the soil. There they live for seventeen years, sucking the sap from the roots of plants, and doing some damage.

HOW MILLIONS OF DOLLARS ARE LOST THROUGH THE WORK OF A LITTLE FLY

At the end of their seventeen years underground they appear as flies, and then attack the foliage of the tree, completely ruining the fruit crop. Of course, some flies of this family appear every year, but it is only once every seventeen years that the multitudes come forth to work havoc. In 1874 the attack of these flies caused damage in four states in America amounting to $100,000,000, not to mention enormous damage through losses in trade dependent upon the crops which these insects had spoiled.

There is another cicada known as the thirteen-year locust, so called because it appears in swarms every thirteenth year. The cicada is a curiosity because of its loud and musical chirping. Some people, when there is not a plague of cicadas, keep the insects in cages for the sake of their chirping, which, when the air is still, can be heard a mile away. Whenever we think of damage done by insects, however, our thoughts always turn to the locust. That was the first destructive insect many of us read about, for its terrible ravages are described in the Bible. Well, the locust appears in just as great swarms to-day, and is every bit as much to be feared as it used to be in the old days.

FLYING ARMIES OF LOCUSTS THAT SOUND LIKE A RUSHING, MIGHTY RIVER

There are many species of locust, and its family includes our grasshoppers. Some locusts are only a quarter of an inch long; others are five inches in length. The female has a strong boring weapon, and with it she drills a hole in the ground, and there lays her eggs. When the young ones are hatched and grow strong, they have hearty appetites. At first they have no wings. So they march in countless armies, in search of food.

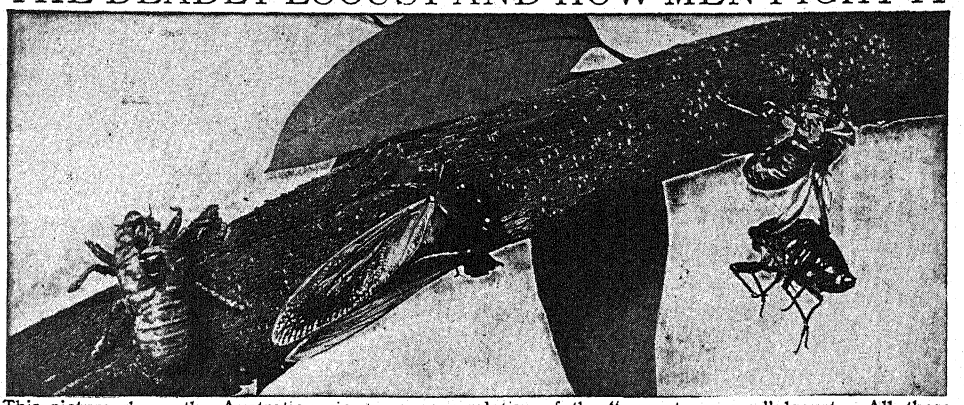
They go straight forward, nothing turning them aside. Every green blade disappears as they go. If they are not stopped, they feed and feed, and presently their wings appear, and then they rise into the air and continue their progress by flying. Then it is that travelers see them in the vast hordes of which they tell us. The swarms blot out the light of the sun. They fill the heavens as with a black cloud, and the noise of their wings and the movements of their hungry jaws is compared to the rushing sound of a broad river. They alight from time to time, and suddenly, where a few minutes before there appeared a field of grain or a grove of trees, there remains nothing but a mass of stubble, or a forest of bare branches.

On and on they go, traveling to lands beyond the sea. They have been met in a cloud 500 feet high, 1,200 miles from land. Wherever they have passed over land they have left ruin and desolation.

A SOLID BANK OF LOCUSTS FIFTY MILES LONG ON THE SEA-SHORE

Sometimes a great wind will blow them into the sea. This happened towards the close of the eighteenth century, in South Africa, where 2,000 square miles of land had been covered by them. A great wind blew them into the sea, and so many were drowned that when their bodies were cast up by the waves they formed a bank four feet high and fifty miles in length. Nothing can save the farmer over whose fields or orchards a swarm of locusts flies. The only hope seems to be to grapple with

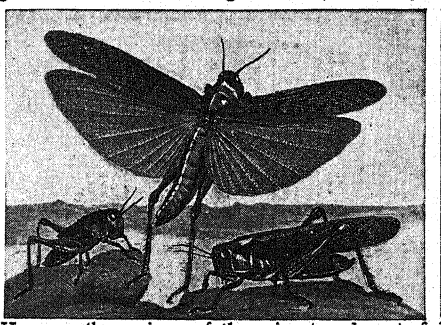
THE DEADLY LOCUST AND HOW MEN FIGHT IT



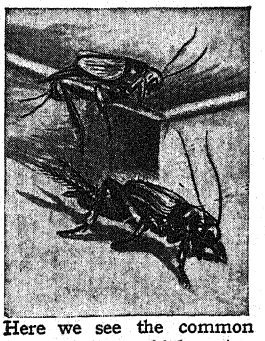
This picture shows the Australian cicada, a near relative of the "seventeen-year" locust. All these insects go through the same four stages as moths. First there is the egg, then the larva, then the chrysalis, and finally the fully developed winged creature. Here we see, on the left, a cicada with the chrysalis shell it has just left, and on the right another cicada leaving the shell, with only the tips of its wings attached.



There are ten different kinds of grasshoppers in Britain. The one shown here is found in the late summer.



Here are three views of the migratory locust of South-East Europe. On the left is the larva, on the right the fully developed locust, and in the middle the same creature in flight.



Here we see the common house cricket, which makes its chirping noise by rubbing its wing-sheaths together.



In those lands where the locust swarms, and works such ruin, the most elaborate and costly means have to be taken to destroy them. Locusts cannot climb up a smooth surface, and so while they are wingless, and thus unable to fly, canvas screens are set up across the line of march of a swarm, and, at intervals, pits are dug at the foot of the screen. The locusts, unable to surmount it, fall into the pits, where they are killed.

them before they get their wings—when they are marching on foot. Until 1881 they used to scourge the island of Cyprus. Then two clever men went into the problem, and mastered the locusts. It was a wonderful thing that they did, and was solely the result of watching the ways of the locusts.

THOUSANDS OF MILLIONS OF LOCUSTS CAUGHT IN ONE YEAR ON ONE ISLAND

The young locusts always march in a straight line. What the men did, therefore, was to erect great screens of canvas, and at the top they put smooth oilcloth. Now, the locusts cannot climb over anything smooth. They attempted to climb up the canvas, but on reaching the oilcloth they fell back off it, crawled along at the foot of the screen until they tumbled into deep pits, which had been dug every few yards at the side of the screens. The pits were lined with polished zinc, so that, once in, the locusts could not get out. The men used 500,000 yards of canvas and dug 26,000 pits, and the result was that in the first year they caught 214,000,000,000 locusts, and in the following year 56,000,000,000 locusts. It cost $135,000 to do the work, but as fifty cents spent meant a million locusts destroyed, they thought the money was well used.

THE LOCUSTS AND THEIR RELATIVES THE GRASSHOPPERS

There are about 500 different species of locusts in this country. They do a great deal of harm, and watchful care must be taken to keep down their numbers, or else they would do tremendous damage. In the early days of settlement in the West, and even as late as 1876, an immense amount of harm was done by the Rocky Mountain locusts. They came in clouds from their home high up in the Rocky Mountains, and when they reached the rich fields of the Middle Western states, they settled down and ate all before them. Many people can remember the helpless despair with which they listened to the steady munching of the countless hordes as they ate up every green thing and left the land brown and bare.

The grasshoppers and crickets are near relatives of the locusts. But we must be sure to remember that we need find no fault with our grasshoppers and field crickets. As a rule, they do no harm. There is one dangerous member of the family, the mole cricket. This one has great claws in front, by means of which he bores a shaft, and from the bottom of it digs tunnels in all directions, like the mole. As he works straight through the roots that lie in his way, he may do a good deal of damage to the garden. The rest are harmless in the fields. Indeed, it is a question whether they are not of benefit to us, as they eat so many caterpillars and other harmful insects.

There is a striking difference between the grasshopper and the locust. The locust has its ears on the side of the abdomen, while the ears of the grasshopper are placed at the sides of its two front legs; and the antennæ of the grasshoppers are long, while in the locust they are quite short. The locust makes its loud chirp by rubbing its rough spiny wings one against another; so do the grasshoppers and crickets. Only the males do this, however, for the females have no means of making this noise. The noise that these male insects make is their way of calling their mates to them, and the female gives the best reply by going herself to answer it. The house cricket cannot be regarded as a friend of man. It is a burglar which gets into our houses, tunnels its way into the side of the fireplace, and comes out at night to steal.

THE HOUSE CRICKET THAT LEAPS AND FLIES, AND GNAWS DAMP CLOTHES

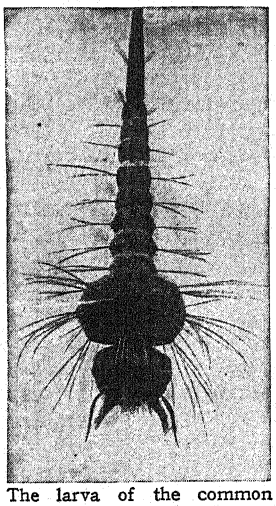
Like the locusts, crickets are great leapers. With their powerful jaws they can do a good deal of damage. They will gnaw holes in damp clothes placed before the fire to dry at nights. This they do for the sake of the moisture in the garments. Crickets can fly as well as jump, but as they only come out at night, and are anxious to get back to their holes the minute a light is turned on, we do not often see them flying.

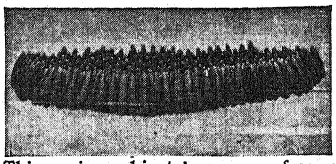
It is evident to most of us that crickets and grasshoppers and locusts belong to the same order, but who would think that cockroaches are of the same family? They are, and so are earwigs, though these are a division by themselves. The cockroach is not a beetle, but is a member of the winged order called Orthoptera. It has, like the cricket, two pairs of wings, the outer ones of a horny character, and acting more as a shield for the others than for the purpose of flight. The

THE MOSQUITO, THE GNAT, AND THE MIDGE

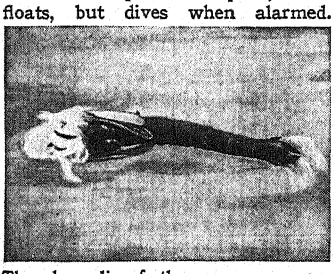


Mosquitoes are found from the Arctic Circle to the Equator. This is the larva of the spotted mosquito, which floats, but dives when alarmed.



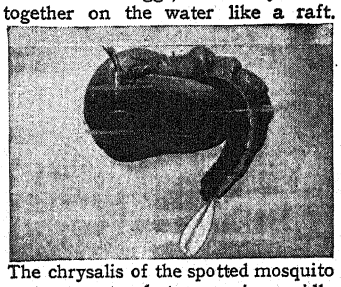


This curious object is a mass of eggs of the common mosquito. There are hundreds of eggs, and they float together on the water like a raft.

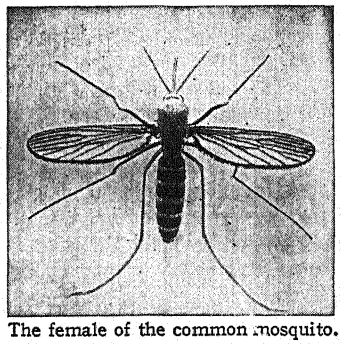


The chrysalis of the common mosquito, shown here, floats on the water, where the skin splits and the mosquito at once emerges.

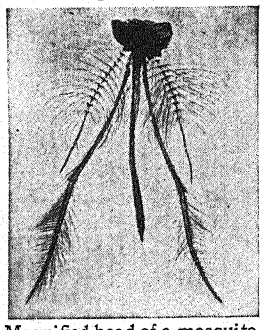
The larva of the common mosquito usually rests at the surface of the water, but if alarmed it goes quickly under.



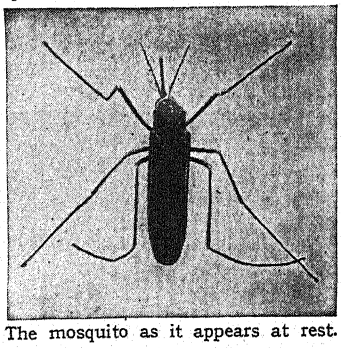
The chrysalis of the spotted mosquito rests on water, but can swim rapidly by jerking its abdomen, which is provided with two paddle-like organs.



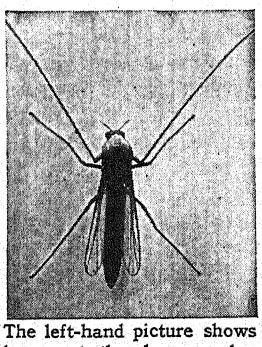
The female of the common mosquito.

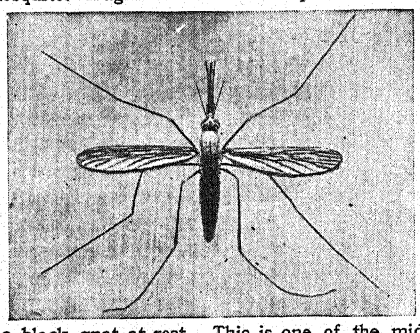


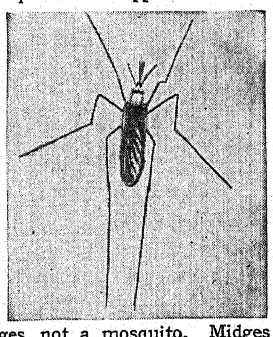
Magnified head of a mosquito.



The mosquito as it appears at rest.







The left-hand picture shows a black gnat at rest. This is one of the midges, not a mosquito. Midges have not the large proboscis of mosquitoes. The other pictures show female spotted mosquitoes.



Malaria is caused by a germ which certain mosquitoes introduce into man's blood. These pictures tell the life-story of the germ, which is magnified 5,000 times. First we see the original germ and then the same germ in the blood. Next it divides up into spores, which become loose, as in picture 4, and grow crescent-shaped, as in the next picture. So far they are harmless, but if the mosquito bites a man the germs return to the insect and change, as in the last three pictures. If reintroduced into human blood, they cause malaria.

under pair, however, are excellent wings, though the cockroach runs so fast with his six splendid legs that he rarely has need to fly. Four members of this family infest our houses and are a hateful pest. The big reddish cockroach that is common in the west is a native, but the other three are immigrants. The "black beetle" comes from Asia, another large brown cockroach from Australia, and the little brown "Croton water bug," that is such a plague in our eastern cities, from Europe. Cockroaches crawl over any food they can reach and have a very unpleasant odor. Some of them are confirmed cannibals.

THE STRONG JAWS OF THE EARWIG THAT BITE AND SPOIL OUR FLOWERS

A European insect by which they are matched is the earwig. Some naturalists say that the earwig will not readily eat the flesh of its kind, but that is not the case. If an earwig be killed, in a few minutes the dead body will be surrounded by half a dozen other earwigs, all eating away as if there were nothing else in the world for them. The earwig does not go so much into houses as the cockroach does; it is usually to be found among flowers. Dahlias are its special favorites, though nasturtiums will always attract it. Its sharp jaws enable it to bite pieces out of the finest blooms, while the insect may generally be looked for in any pear or apple which a bird or wasp has attacked. There are few earwigs in this country.

The mother cockroach lays her eggs in the most beautiful little horny case, sixteen eggs to the case; but after that she cares no more, and leaves the little ones entirely to themselves. The mother earwig is a really affectionate parent, and "mothers" her little ones like a hen or an old lady lobster. It is interesting to notice how quickly an earwig drops to the ground if it is alarmed, or if it wishes to get quickly to the floor from the ceiling on which it is resting.

THE STRANGE TICKING SOUND OF A LITTLE BROWN BEETLE

What is this fearful "death-tick" or "death-watch"? It is a sound made by several little wood-boring insects. They are simply rather fat red-brown beetles which bore their way into the woodwork of our furniture, tunnel through and through it, eating the wood which they bore, and ruining the furniture just as fast as they can. They have thick, horny heads, and the so-called death-tick is the result of the beetle's calling to its mate, as the cricket calls to his.

But instead of rubbing legs or wings, the beetle bangs his silly little head on the wooden floor of his tunnel, and that is the way he signals to his sweetheart. Generally he knocks four or five times, then is still. Men have kept these insects at various times, and tried to make them utter their signal in the open, but without success, until one man chanced to knock gently with a pencil near the box in which the beetle was. Instantly the beetle thumped away with his head. And if we capture one of them and gently tap four or five times so that the beetle may hear, we can have as many "death-warnings" as we like, whenever the beetle is not asleep or too busy feeding.

The beetle that we have been discussing now is one of a family of insects which make their way into woodwork. They are as great a nuisance on land as the wood-boring worms are in the water. All the holes that we see in what we call worm-eaten wood are caused by these little pests and their young ones.

THE COMMON FLY THAT SPOILS THE MILK AND SPREADS DISEASE INDOORS

We need not leave the house to discover one of the greatest of pests, the fly. The only thing that can be said in favor of flies is that they are good scavengers out of doors, and drink up stagnant liquids which would otherwise make the atmosphere foul. But in civilized countries we ought not to have to depend upon methods of scavenging such as prevail among savages. Flies carry disease to our food. When they are most abundant, in the latter part of the summer, they poison milk and other food which little children take, and cause many, many deaths. Indeed, the wise men of one big town in the North of England, where there are many poor people, came to this conclusion—that it would be cheaper for the town council to provide, at their own cost, pure milk which flies had not corrupted, than to bear the cost of all the funerals of little pauper children whose deaths had been caused by dirty habits of the flies.

Nothing is too bad for a fly to eat. It

settles upon poisonous refuse, then flies off with parts of the poison adhering to it into a house, and there settles down on foodstuffs, on sugar, into milk, and so forth, and leaves corruption wherever it goes. The eggs of the common house-fly are laid in refuse, where the grubs hatch and feed.

LITTLE FLIES THAT ARE OLD AND BIG FLIES THAT ARE YOUNG

Then they pass into a chrysalis stage, and eventually issue as perfect, full-grown flies. When we see flies of different sizes, we must not imagine that one is a young fly and another an old one. They are all fully grown when they leave the chrysalis. We have two or three sorts in our houses. One of them, the one which we fancy bites, and does really bite, bites us to suck our blood. It is called the stomoxys, and is a small black fly, that does not appear until the autumn. The flies which we see hanging swollen and dead about the house have been killed by a fungus which attaches to them. This fungus eats its way into the body of the fly and kills it, and then spores drift off to become attached to other flies.

The bluebottle, which we almost forgive for its bright coat and breezy hum, is a filthy enemy of the larder. It deposits its eggs upon flesh, or in wounds of animals, and there the eggs hatch and the larvæ feed where they are.

BRAVE MEN WHO HAVE DIED TO SAVE US FROM PLAGUES CARRIED BY FLIES

As might be expected, there are innumerable varieties of flies in lands where we have heat and moisture prevailing in forest and swamp. South America and many parts of Africa are rendered almost unbearable by flies that sting and bite, while large areas in Italy—to name only one part of Europe—are the seat of disease and death every summer, as the result of winged plagues in undrained lands.

There is still much to be learned about poisonous insects, and many men are bravely devoting themselves to the work. Many men have sacrificed their lives while studying the problems. They have gone into lands infested with deadly insects, and allowed themselves to be bitten so that they might trace the manner in which the disease begins, the insects from which it comes, and the manner of dealing with it. The story of these men is very sad but very wonderful. They are as brave as the bravest soldier that ever fought on a battlefield, for they fight, not to kill men, but to save them, and they lay down their own lives to save those of millions of people who may never hear of them or of the sacrifice they make. Naturally, where there is so much to be learned, the way to knowledge is hard and difficult to discover.

HOW THE MOSQUITO CARRIES DEATH

One of the deadliest insect foes of man is the mosquito, the little insect with a musical song that we all know so well. It is only the female mosquito that sings, but to make up for his silence, the male has beautiful feathery antennæ which catch the waves of sound, and take the place of ears. It is also only the female that bites; the harmless male lives on vegetable matter.

There are many varieties of mosquitoes in America; all of them troublesome, and some of them dangerous. While they have not in this country worked such havoc as in India, where in one year 5,000,000 people died of malaria, many hundreds of thousands of people have died of malaria and yellow fever, both being carried by mosquitoes. They are not such a pest in the North, but even there they may cause disease and death.

While yellow fever was chiefly known in hot regions, people noticed that this disease and malaria was most common in low-lying swampy places, and it was long thought that they came from breathing poisonous fumes or "miasma" that rose from the ground. But as more knowledge was gained about disease, scientists began to think that this was not true, and brave men devoted their lives to solve the problem. Many men worked at this task, but we shall try to remember only the most famous—Major Donald Ross, who discovered that malaria is carried by a mosquito called anopheles, and Major Walter C. Reed, who found out that the bite of a mosquito, called stegomyia, brings the dreaded yellow fever.

We have read on page 2990 how the young ichneumon fly lives in the body of a living caterpillar, and we call it by the ugly name of parasite, because it lives on something else, and eats its substance. But there are smaller

parasites than the ichneumon, some of them so small that they can only be seen through a microscope. These tiny parasites increase in number by dividing up and growing, and dividing up and growing again. Many of them live in the blood of animals, and one of them causes malaria, and another yellow fever in man. The question was, how do these parasites or germs get into man's blood?

A few scientists had learned to believe that the malaria germ is carried by mosquitoes, but this was difficult to prove, and Dr. Ross spent many months of study in India before he could do it. He examined hundreds of mosquitoes, and, after many disappointments, found in a single anopheles mosquito the tiny organism that causes the trouble. Then he set himself to study that species of mosquito, and was soon able to tell the story of the mischief that it does. When the anopheles bites a person who is ill with malaria, along with the blood, it sucks up the germs which quickly multiply and spread through its little veins and tissues. Numbers of them gather in the poison gland of the mosquito, so that when it bites another person, the parasites are forced into the wound, and reach the blood, where they create a poison and cause malaria.

A year or two after Dr. Ross began his work in India, Major Reed went to Cuba to study the cause of yellow fever in the same way. Dr. Reed and his assistants allowed themselves to be bitten, and some of them died, but they proved without doubt that yellow fever is carried from one person to another by the stegomyia mosquito. They have saved many useful lives from the same sad fate, and their death has not been in vain.

It would be of little use to find the cause of death unless we were able also to find a remedy. Now, the life-history of mosquitoes and midges is very similar. The full-grown insects lay their eggs either in water, or in damp, decaying vegetation, or behind the bark of fallen trees. There they hatch and come forth as full-grown insects, ready to carry on the work of destruction.

In many countries there is very little attempt at proper drainage. Stagnant pools lie about in the streets; rubbish collects in the villages; dirty old tins and cans lie about with water in them; cisterns are uncovered; there are a thousand places in which the deadly insects can be reared. Therefore, it is evident that if men, women, and children are to save their lives from the attacks of the insects, they must be clean in their habits.

DEADLY INSECTS THAT COMPEL US TO OBEY THE LAWS OF HEALTH

They must allow no pools of water to collect in their streets; they must allow no swamps to remain undrained near their cities; they must have no water-tanks open, or if they are open, then kerosene must be poured into the water to kill the insects there.

These horrid little insects, for whose existence it seemed impossible to find any excuse, might seem to have been sent by Nature to teach men to be clean. Towns which had been hot-beds of disease became absolutely healthy when these new rules were enforced. Death had been frightfully prevalent among the men who were building the Panama Canal, because of the bites of mosquitoes. The American Government sent skilful, determined men to carry out the work of making men clean and careful.

Stagnant pools were dried up; all rubbish was burned; no place was left in which mosquitoes could lay their eggs. And the result was that yellow fever and malaria disappeared. The same thing can be done for the health of people in the deadliest climates. If they will only attend to the laws of health, they need not fall victims; if they neglect them, they fall victims to the insects which carry death. The same law applies to horrible parasites which afflict human beings at home.

HOW NATURE USES TINY INSECTS TO PUNISH CARELESS FOLK

Many unpleasant things live upon the bodies of human beings if human beings are not careful. There is a parasite for everything. Animals, poultry and birds have theirs, and man has his. Man, with his superior sense, can avoid them if he will. All that he has to do is to keep himself perfectly clean, and he will escape, or, if he is temporarily attacked, he must rid himself at once, and all will be well. If he will but keep himself clean, he can keep himself free; if he does not, then he must pay the penalty. Nature has no mercy for the careless and unclean.

The tsetse flies in Africa have become greatly dreaded since it has been proved that they are responsible for the spread of fatal disease. Scientists have given them the family name of glossina, but they are usually called tsetse, which is the white man's way of pronouncing the native name. One species of tsetse fly, the glossina marsitans, carries in its bite the disease called nagana by the natives, which is fatal to domestic animals, and another species, the glossina palpalis, spreads suffering and death among men by bringing to them the disease which we know as sleeping sickness.

When men are attacked by sleeping sickness, they are overcome by a desire to sleep, all their energy and will-power go from them, and they die. No cure has been found for the disease, but it has been learned that it is caused in the same way as malaria and yellow fever, and that just as the mosquitoes bring these diseases, the tsetse carries the parasites, which cause sleeping sickness, from one person to another.

Hundreds of thousands of people died from sleeping sickness before the guilt of the tsetse fly was discovered, and as the natives traveled about more after the country was opened up by white men, more of them came within reach of the tsetse fly and the disease was spreading rapidly. The populations of villages and whole districts fell victims to it, and it seemed as if some of the native races would die out.

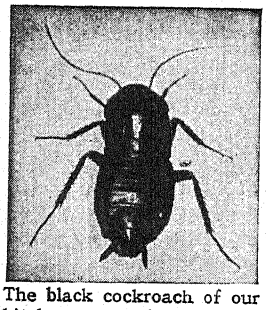
It has been found, however, that glossina palpalis lays its eggs in the bush on the banks of lakes and rivers, and that the larvæ live only in damp shady places. Therefore it has been made a rule that the bush must be cut back thirty yards from the banks, wherever people live, so that the hot sunlight may kill the larvæ before they can transform themselves into deadly flies. It is hoped that if the country can be rid of the flies, sleeping sickness may be stamped out. All the nations who have possessions in Central Africa joined in the effort to prevent the disease, and great men lived for months in unhealthful, swampy places to gain the knowledge that we can now learn so easily.

We ought to feel very thankful that the horse-flies do not often attack us. They are the great bodied wretches which hum so loudly as they fly. They do not often bite men, but when they do they show the most alarming intelligence. They settle upon the back or shoulders, so that they may bite and not be immediately perceived, and so powerful are their tools that they can pierce thick clothing, and so reach the flesh beneath. Horses they attack by settling where the animals will be least likely to reach them with their tails.

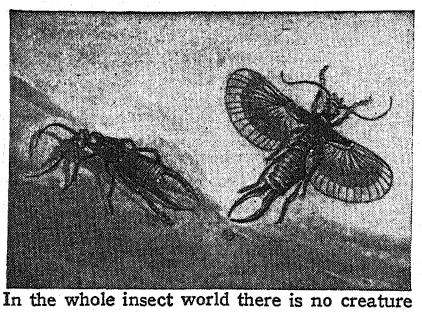
There are other enemies of men which do not fly, and one is the harvest tick, sometimes called a jigger. It is a little villain like a tiny copy of the red spider, whose attacks upon greenhouse growths the gardeners so much dread. This insect reaches full growth in harvest time, and as we make our way through the fields, climbs upon us and crawls about our bodies until it can make its way into the flesh. It is almost impossible to see a harvest tick at the best of times, but once it has had a few minutes' start, to find it is impossible, for it tunnels into our flesh, and though it causes the most irritating smart, we cannot reach it except by practically digging it out. The best thing to do is to rub the spot with ammonia.

THE MOTH THAT SEEKS TO DESTROY THE COTTON CROP

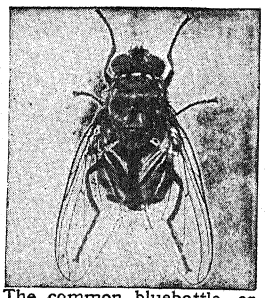
Some of the moths must be included among the insect foes of man, or rather their children are destructive, for, as we have learned, it is the caterpillar that eats and eats and eats. One of the most dreaded of these foes is a brownish moth, which is known all over the United States and Canada. The ugly greenish-brown caterpillar is very greedy and causes immense loss. It feeds on corn, tomatoes, tobacco, and especially on cotton. The caterpillar is known by some of us as the corn-worm or tomato-worm, and in the south where it does most damage it is called the tobacco-worm, or more generally the cotton boll-worm. This innocent-looking little moth and the boll-weevil, of which we shall read on page 3205, are the worst enemies of the cotton-grower and cause him many hard-working days and sleepless nights. When the caterpillar is fully grown it makes its way several inches underground, turns round and burrows out a gallery which just stops short of the surface, and then goes back to the end of the gallery to turn itself into the chrysalis from which will come



The black cockroach of our kitchens comes from the Far East. It has wings, is distinct from the black beetle, and is, in fact, not a beetle at all.



In the whole insect world there is no creature that has such large and gauzy wings folded into so small a space as the earwig. Here we see an earwig with its wings closed up, and on the right the common earwig with wings extended.



The common bluebottle, or blowfly, has a keenness of sense, probably of smell, which enables it to discover flesh at great distances.

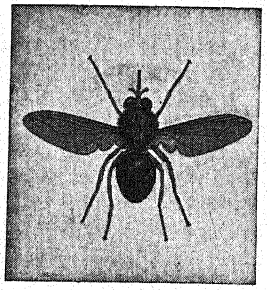
the moth for which it has made a way to reach the upper world. The pupæ of the caterpillars born in the fall live in the ground all winter, and the best way to get rid of them is to plough up the ground.

A CATERPILLAR WHICH EATS OUR APPLES

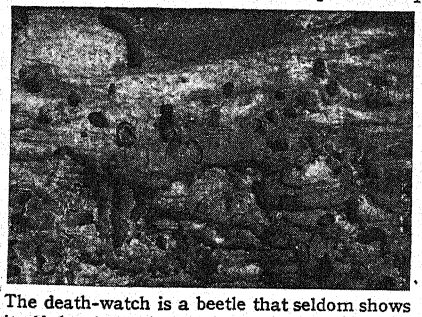
Another moth which does an immense amount of harm is the codlin-moth. When in the summer we hear the unripe apples fall lightly to the ground, we know that the codlin-moth has been at work. Then the boy scout can perform many good deeds by gathering up the fallen fruit. If there are no horses, cattle, pigs, or chickens near at hand to devour them, grubs and all, he should see that the apples are destroyed. Or he may employ some of his energy in dressing up the trees with bands of hay. It is interesting to see how the hay becomes full of cocoons, and this makes an easy way to burn them.

The codlin-moth lives in the pupa stage all winter. In the fall the caterpillar creeps under loose bark on the tree, or into a crack in an apple barrel, or a sheltered place in the cellar. There it spins a paper-like cocoon, and in the springtime, when the apple blossoms are in flower, is ready to come out. The female moth lays her eggs singly, on leaves, or in the calyx end of the fruit. The caterpillar hatches out in a few days, and at once begins to work its way into the apple. This little immigrant moth costs the country tens of millions of dollars every year.

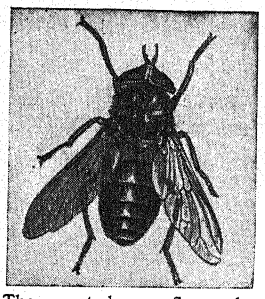
Codlin-moths are not the only pests that fruit-growers have to fight. When we bite into an apple or a plum, and find curled up in it a fat, white, footless worm, we must not yield to our natural feelings of disgust, and throw it away. It is better to destroy the grub, for it is the larvæ of either a curculio or a weevil. The female beetle uses her snout to bore a hole in the fruit. There she lays an egg, pushes it well down, and goes off to treat another fruit in the same way. The egg hatches into the white grub we know so well. It lives in the fruit until it is well grown. Then the fruit falls, the worm crawls into the ground and becomes a pupa, and by and by appears as a fully developed beetle.



This is the tsetse fly of Africa. The bite of one species causes sleeping sickness in man. That of some other species is fatal to domestic animals.



The death-watch is a beetle that seldom shows itself, but its curious ticking sound is feared by the superstitious, and it works havoc in our furniture and the floors and beams of our houses by riddling the wood with tiny holes.



The great horse-fly sucks the blood of our horses and cattle, and in India even the elephant's thick skin does not protect him from it.

The photographs on these pages are by Gordon W. Pepper, Frank P. Smith, Percy Collins, and others.

THE CURCULIO WHICH DESTROYS THE FRUIT

The curculios and the weevils, which are very close relatives, feed on fruit, and nuts and grain, and do an immense amount of harm to the crops which they attack. They are little brown beetles, and are easily recognized by their snout or beak. This is differently shaped in different species, but all have it, and another curious thing is that the antennæ grow on the sides of the snout. The beetles live all winter, and if we wish to have good fruit, we must not leave rubbish lying about in the orchard or garden to shelter them. The curculios curl up, drop off the trees and pretend to die when they are frightened. To see them play this trick, all we have to do is to spread a sheet on the ground and jar the tree slightly. When we have done this we can of course turn the trick by gathering up the sheet and destroying the beetles. Plums and apples and quinces all suffer from curculios, and in some places gardeners have had to stop plum-growing altogether.

THE DREADED BOLL-WEEVIL WHICH RUINS THE COTTON

A great number of the weevil family are pests; but perhaps the worst of all is the boll-weevil which destroys great quantities of cotton every year. This destructive little beetle came originally from Mexico, and has spread through Texas, Louisiana, Mississippi, Alabama, Arkansas, and is making progress in other states. It has been known to destroy as much as nine-tenths of the cotton crop, where it has been allowed to make headway. The little insect which creates so much havoc is a small brown beetle, only a quarter of an inch long, with a thick, round body, and a blunt, beak-like snout. In the spring, the weevils come from their winter dwellings, and the female weevil pierces the cotton bud, or square as it is called, and there lays her eggs. The eggs soon hatch out, and the larvæ appear and live in the bud as in a house. The larva turns into a pupa there, and only makes its way out after it has been transformed into a beetle. There may be four generations of boll-weevils in one year, and when the squares are gone, the children and grand-children of the first generation lay their eggs in the bolls which escaped earlier in the season, and ruin them.

LILLIPUTIAN ENEMIES OF THE WHEAT

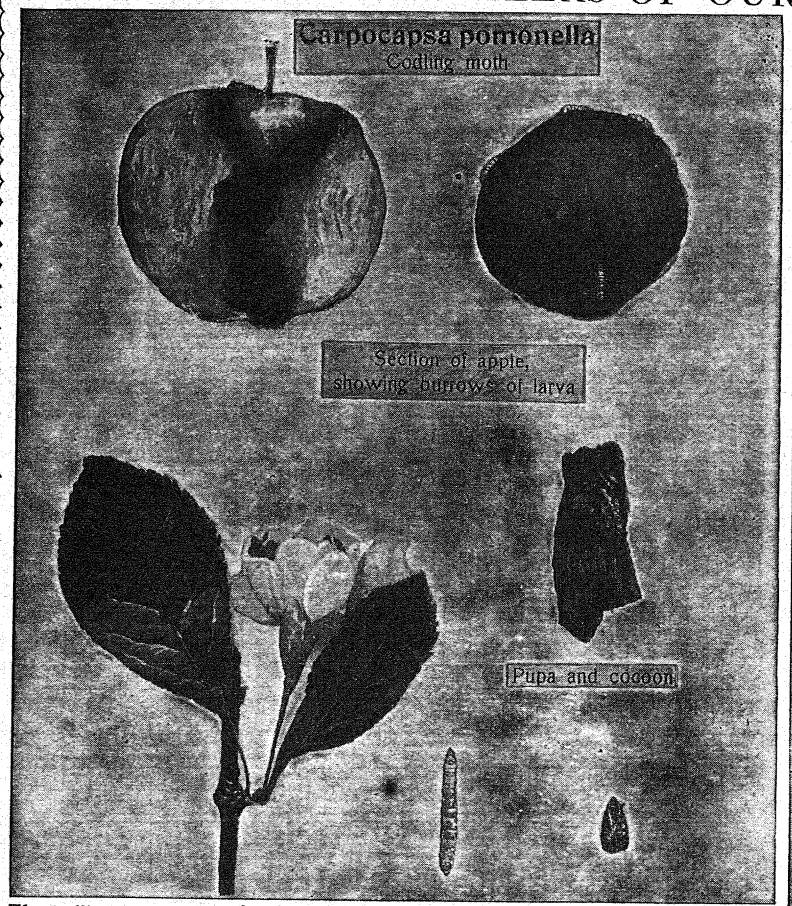
You remember how the Lilliputians made Gulliver prisoner by swarming over him in such numbers that they were able to bind him fast. It is in just the same manner that the chinch bugs destroy acres and acres of grain. The farmer who finds young chinch bugs in his wheat at once looks about for a means of preventing them from reaching other crops. He can do little with that special field, and he knows that when they have finished with his wheat they will make straight for his corn. They come in countless millions and cluster thickly up the stalks of wheat and corn, like aphides on a flower stem, or the Lilliputians over Gulliver in the story, and suck the sap of the young plant until it dies.

So that it may be able to reach the sap, the chinch bug is provided with four little instruments like tiny needles. The bug's lower lip has grown quite long and curls round the stylets, as the little needles are called. The stylets pierce the outer skin of the stalk, and a strong muscle at the back of the insect's throat pumps the sweet sap up through the tube. The young bugs hatch out exactly like their parents, except that they have no wings, but have to molt their skin several times while they are growing up.

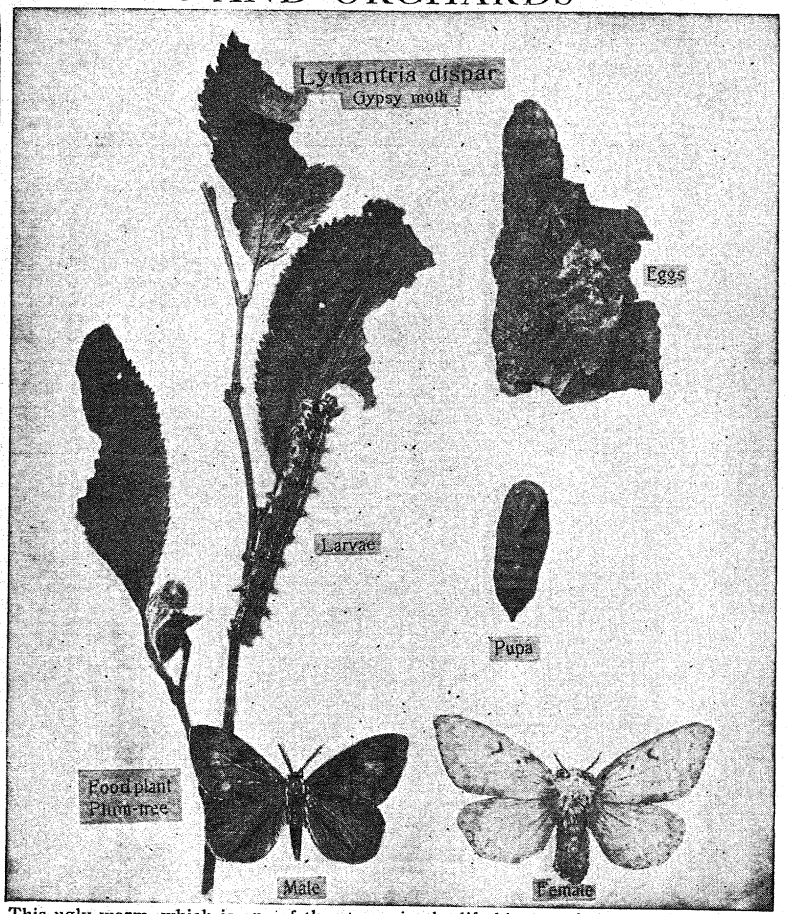
A still smaller enemy of the harvest field is the Hessian fly, a tiny midge which was imported in some way from Europe about the time of the Revolution. This tiny little fly—it is only about a tenth of an inch long—lays its eggs on the leaves of the young wheat plants when they are opening out. The larvæ hatch out from these little eggs, and, creeping down the furrow of the leaf, reach the sheath, and in this comfortable shelter live on the sap until they are ready to become pupæ. The pupæ turn into full-fledged flies in a very few days, and are soon ready to commence the mischief all over again by laying a fresh supply of eggs. As many as four or five generations may be born in one season, and the last of the season drop to the ground in their little hard pupa cases, which look something like flax seed, to pass the winter unnoticed among the stubble.

THE NEXT STORIES OF NATURE BEGIN ON PAGE 3255.

TWO DESPOILERS OF OUR WOODS AND ORCHARDS

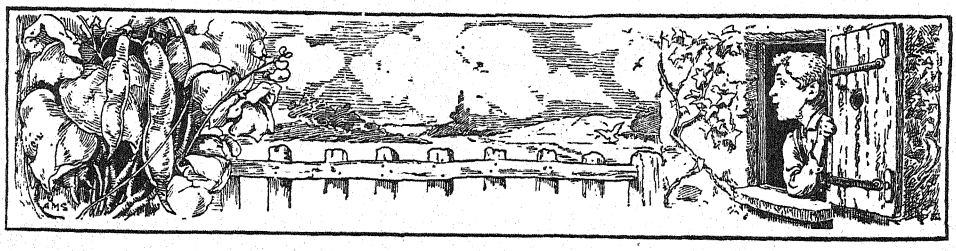


The codlin, or codling moth lays an egg on the flower. The grub eats into the fruit and remains until grown, when it comes out to spin a cocoon from which a moth emerges. The same cycle then goes on and many orchards are entirely ruined.



This ugly worm, which is one of the stages in the life history of the gypsy moth, has ruined thousands of valuable trees.

Photographs by Brown & Dawson.



JACK AND THE BEAN-STALK

CONTINUED FROM 3166

A VERY poor widow woman once lived with her only son, Jack, in a little cottage on the border of a great wood. They were so poor that often Jack went supperless to bed; and at last things became so bad that Jack's mother made up her mind to sell their cow, the one possession they had left. So, when market-day came round, Jack set out, driving the cow before him, determined to make the best bargain he could.

On the way he met a man with a bag of beans in his hand. Jack took such a fancy to the beans that he begged the man to give them to him.

"No, indeed," replied the man. "They are magic beans. But you shall have them in exchange for the cow."

To this the boy readily agreed. The man took the cow, well pleased with his bargain; and Jack ran home to show the beans to his mother. The poor woman wept when she heard the story, and was so angry at Jack's stupidity that she flung the beans out of the window.

Jack went to bed very cross that night, but when he got up the next morning he was surprised to find something in front of his window. It looked like a huge tree; but, on going nearer, he found that during the night the wonderful beans had twined together and grown to a tremendous height; indeed, the top of the stalk was almost out of sight.

In a twinkling Jack sprang up the bean-stalk. Higher and higher, and still higher he climbed, until he began to lose his breath. When he at last reached the top, he found himself in a strange country. He walked along a little way, and presently met an old woman. Jack had never seen her before; but, to his great surprise, she said: "I know you quite well, Jack. Years ago a wicked ogre killed your father and stole all the money which should rightly belong to you. This ogre lives close by; and if you want to punish him, I can help you."

Jack replied that he certainly did want to punish the ogre, and asked where he lived.

"In that great castle over yonder," replied the old woman, who was a witch, and with that she vanished.

Jack made his way to the castle which the old witch had pointed out, boldly mounted the steps, and rang the bell. A woman opened the door; and Jack asked for a night's lodging.

"Alas!" replied the woman, "I dare not take you in. My husband is an ogre, and if he finds you he will surely kill you and roast you for supper."

"But can you not hide me?" asked Jack, who was no coward.

"I will do my best," said the woman; "but you must promise to go away the first thing in the morning."

When Jack had promised, she took him into the kitchen and gave him a good meal; but before he had finished, there came a tremendous knock at the door.

"Quick!" cried the woman. "Jump into the oven, and don't make a sound till my husband has gone to bed."

In scrambled Jack; and a minute later the ogre strode into the room.

"Wife," he cried out, in his terribly loud voice, "I can smell fresh meat!"

Jack trembled at the voice of the ogre.

"Nonsense, my dear!" he heard the wife say. "See what a fine supper I have prepared for you."

The supper was so good that the ogre instantly sat down and made a good meal, and when he had finished he told his wife to bring in his favorite hen. She went outside, and returned with a beautiful hen, which she set down on the table.

"Lay an egg!" commanded the ogre; and the hen instantly laid a golden egg.

"What a useful bird!" thought Jack.

Soon after this the ogre fell asleep, and snored so loudly that his snores shook the walls. As soon as Jack heard them, he crept out of his hiding-place, picked up the hen, and ran away. On and on he ran until he reached the bean-stalk, which he climbed down as fast as ever he could go. When he reached the bottom he flew to his mother and told her what had happened. The widow was overjoyed, and called Jack her "brave boy." They sold the golden eggs which the wonderful hen had laid, and lived very comfortably for some time on the money they were able to get for them.



Jack reached the bean-stalk, and began to climb down with the harp, while the ogre followed in hot pursuit.

But after a while Jack began to long for more adventures. So one day he disguised himself as well as he could, climbed up the bean-stalk, found his way to the castle, and again asked the ogre's wife to give him food and lodging. But the woman shook her head, and said that the last time she had befriended a poor boy the ungrateful wretch had repaid her by stealing the ogre's favorite hen. But Jack begged so hard that at last she consented, and this time hid him in a cupboard.

Presently the ogre returned to the castle. As he entered the kitchen, he cried out in a terribly loud voice:

"Wife, I smell fresh meat!"

"Nonsense, my dear!" replied his wife, as before. "See what a fine supper I have prepared for you."

The ogre sat down and ate his supper. When he had finished, he roared:

"Bring me my money-bags!"

His wife brought the bags, and laid them on the table. The ogre counted his money, put the coins back into the bag, and then fell asleep. Out jumped Jack, caught up the money-bags, ran out of the castle, and was soon back again in the cottage.

"You need not mind spending all this money, mother," he said, pulling the bags out of his pockets one after the other, "for that bad man stole it from my father, and it is all our own."

Some time after this Jack once more climbed the bean-stalk and made his way to the castle. This time he dare not let the ogre's wife catch sight of him, but after waiting about for some hours he managed to slip in and conceal himself in the boiler just before the ogre returned.

"Wife, I smell fresh meat!" roared the ogre, directly he set foot in the kitchen.

"Oh, no!" replied his wife. "You are always fancying there is someone in the house. This time I am certain you are mistaken."

When the ogre had eaten his supper, he called for his harp. His wife brought it and set it on the table, and at a word from the ogre it began playing by itself.

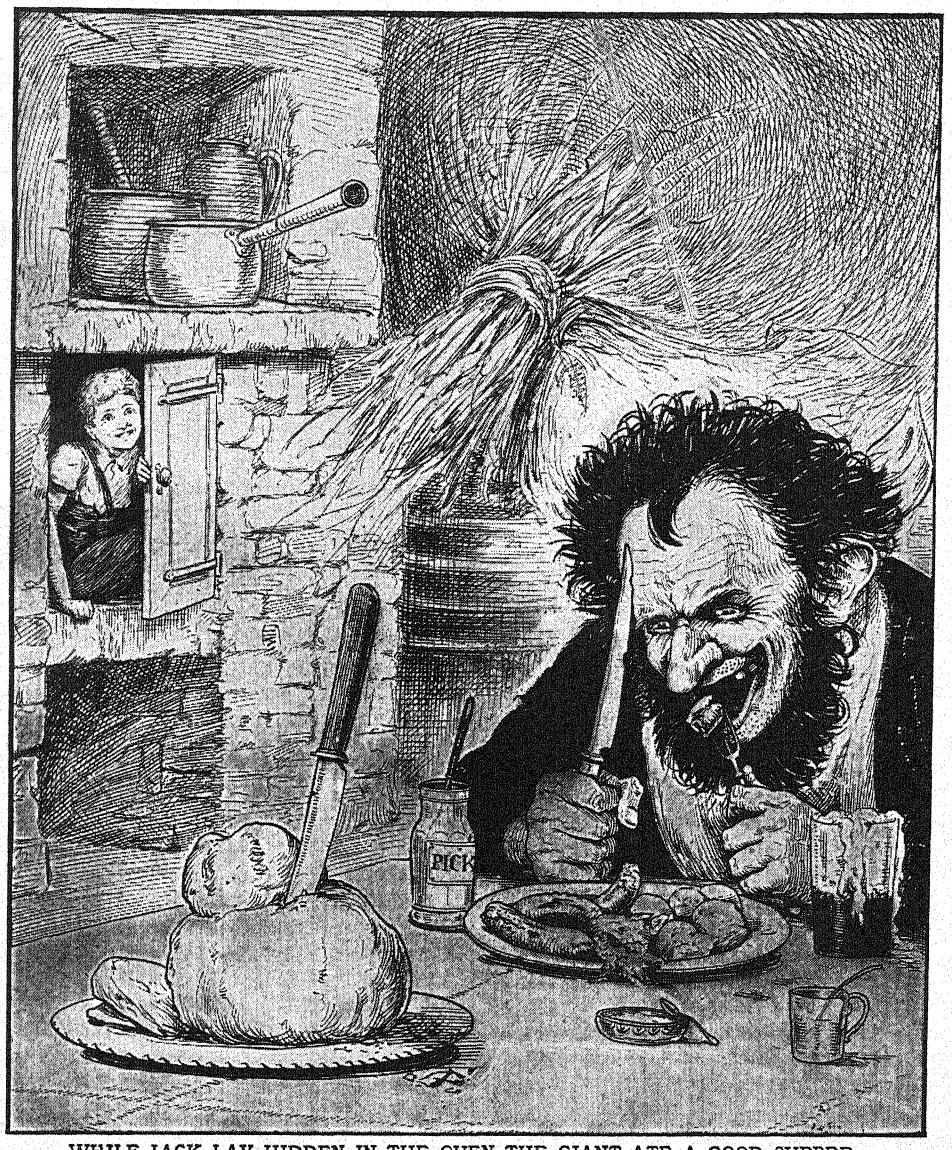
This so pleased Jack, who was peeping over the top of the boiler, that he determined to have it.

As soon as the ogre was safely asleep, Jack jumped up, seized the harp, and flew out of the room. But the harp was a fairy harp, and it shrieked out:

"Master! Master!"

that there was not a moment to be lost. "Mother! Mother! Bring the hatchet. The ogre's coming down!" he shrieked.

Out rushed Jack's mother. Jack seized the hatchet, and with a single blow cut the bean-stalk right through. Down fell the ogre with a frightful crash, and so ended his wretched life.



WHILE JACK LAY HIDDEN IN THE OVEN THE GIANT ATE A GOOD SUPPER.

The ogre started up and rushed after Jack, who was running away as fast as he could. He reached the bean-stalk, and began to climb down quickly. When he reached the ground, the ogre was nearly half-way down. Jack saw

Jack and his mother lived many happy years after this. When Jack grew to be a man, he fell in love with a beautiful princess and married her, for by that time Jack was rich and his adventures had made him famous.

LITTLE STORIES ABOUT FLOWERS

Almost every flower has a story, just as almost every place has a legend, and many flowers have many stories. They are "made-up," perhaps, as the legends are, but they are often very beautiful, and it is interesting to know the stories that have been told for hundreds of years about the flowers that bloom in our gardens still.

THE PANSY

THE charming name which many little English country maidens have given to the pansy is Three-Pretty-Faces-Under-One-Hood. The little French country maidens, however, called it Trinity Herb. At first, they say, the pansy had a sweeter and more delicious scent than its little sister, the March violet. It grew in the wheat-fields, and it was much beloved because of its union of beautiful colors and exquisite fragrance, and everybody used to trample down the wheat to get it.

The result was, that when harvest-time came there was no food for the people. This grieved Three-Pretty-Faces-Under-One-Hood, and one springtime she prayed to the Trinity that she might be deprived of her sweet scent, so that nobody would destroy the growing wheat for her sake. Her prayer was granted, and her scent taken away. From that time Three-Pretty-Faces-Under-One-Hood has been called Trinity Herb by the little French country maids.

THE FORGET-ME-NOT

IN the morning of the world, an angel was sent on a message to a holy man dwelling in a desert in Persia. But as the angel was flying through the air he saw a beautiful Persian girl sitting by a well-side, and braiding her lovely hair with blue forget-me-nots. He came down and made love to her, and for a while they lived very happily together. Suddenly the angel remembered that he had not delivered the message. He flew back to heaven to ask pardon, but he found that the gate of heaven was closed to him. For a long time he stood by the closed gate weeping, and then the Archangel Gabriel appeared, and said:

"It is ordered that you must people the earth with the Children of the Sky before you can bring a daughter of the earth into heaven."

The angel did not understand what this meant, and asked his beautiful bride if she could explain it.

"Yes," she replied, taking some of the flowers from her hair. "These lovely blue forget-me-nots, which reflect the exquisite color of heaven, are the Children of the Sky."

So the angel and his bride wandered hand in hand over the earth, and planted forget-me-nots in every country. Then, when their task was ended, the angel took his bride in his arms, and carried her up to the gate of heaven.

THE ROSE

IN the days of the ancient gods, there lived in the Greek town of Corinth a maiden whose name was Rhodanthe. Rhodanthe was very beautiful, and her house was besieged by kings and lords, who were eager to win her love.

In order to escape from the throng of her lovers, Rhodanthe fled for refuge into the temple of the white and lovely goddess of purity, Artemis. But her lovers followed her, and the people of Corinth helped them to break open the gates of the sacred temple. Artemis was angered by the outrage, and she changed Rhodanthe into the red rose, which is still deeply colored with the blush which spread on Rhodanthe's cheeks when her beautiful face was exposed to the gaze of her lovers. The breakers of the temple, on the other hand, were changed into the thorns which now guard the loveliness of Rhodanthe.

THE ANEMONE

THERE was once a Spirit of the Flowers whose name was Chloris, and the Spirit of the West Wind used to come into her garden and make love to her. The Spirit of the Flowers had many pretty nymphs in her garden, and among them was a little maiden who was called Anemone.

One day the Spirit of the West Wind turned away from Chloris and began to make love to Anemone. This made Chloris very angry, and she drove Anemone out of her garden, and left her to perish in the wild woods.

Happily, the Spirit of the West Wind passed through the woods, and he found Anemone, just as she was dying, and turned her into the little, white, tender, and graceful flower which now grows beneath the trees in early spring.

THE NEXT STORIES ARE ON PAGE 3277.



GOLF FOR BOYS AND GIRLS

GOLF is one of the few outdoor games in which boys and girls can compete on equal terms.

CONTINUED FROM 3117

A golfing outfit for a boy or girl consists of four clubs, which are called a driver, a cleek, a mashie, and a putter, and they should be carried in a light canvas bag. The driver is a wooden-headed club; the cleek, mashie, or "lofter," and putter are iron headed; and the cost of each is from a dollar up. In addition there should, of course, be two or three golf-balls.

The driver is used for driving off from the tee; the cleek is for an "approach" shot—that is to say, for the intermediate shot, or shots, less than a hundred yards in distance, and taken between the spot where the ball rests after we have made our drive and its arrival at the green. The mashie, or lofter, is employed in place of the cleek if the lie, or position, of the ball is awkward—if, for example, it is in a hole or has rolled into a bunker, or is lying on very rough ground. Owing to the curious shape of the head of the mashie, it is specially useful for "lofting" the ball up out of a difficult place, which is done by striking the ball very low down, almost from underneath, in fact. The putter is used when the ball is on the green, to play it into the hole.

A match usually consists of two players. When four players play together the match is called a "foursome," each pair of partners in this case sharing a ball, and taking it in turns to strike. An ordinary full-sized golf-links consists of eighteen holes, each of which is set in the middle of a putting-green, and it is the object of the player to get the ball into each hole in fewer strokes than his or her opponent.

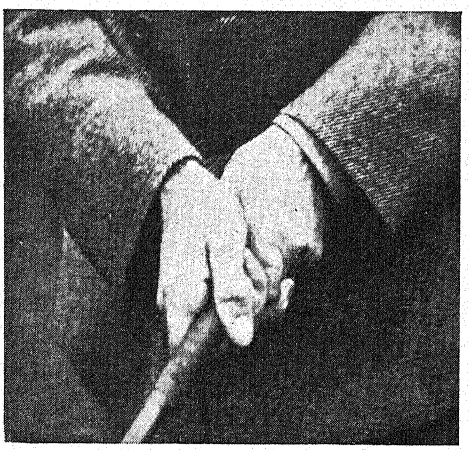
Close beside each putting-green there will be found a teeing-ground—a small, flat, slightly raised platform, which is provided with a box of sand and an indicator showing the direction of the next hole. Now, a proper golf-links is laid out in such a manner that the direct line from each teeing-ground to the next hole is comparatively clear of obstacles, so that by correct play it is possible to reach the putting-green surrounding the hole without getting into difficulties; any deviation from this straight course, however, will be found to lead the player into trouble. His ball will get into a bunker, either natural or artificial, for most golf-links are provided with specimens of each kind.

A belt of low-bushes, a ditch, a pond, a shallow trench filled with a layer of sand and with a bank of earth running the length of it on the opposite side, all make suitable bunkers, and the difficulty of getting through, or over, or out of any of these hazards, when once one is in them, will be readily understood. The player's principal object therefore is, first, to learn to hit a ball true in the centre with the middle of the club-head, so that it may travel straight, not "slicing" or pulling it to right or left, or topping it, so that, instead of soaring away for a hundred and twenty to a hundred and fifty yards, as it should do easily, before coming to earth, if properly hit, it pitches dead into some obstacle a short distance away, whence it can only be extricated after endless trouble. Often there is a bunker between the player and the straight line to the hole, but this is placed in such a position that a correct shot should carry the ball over it towards the green.

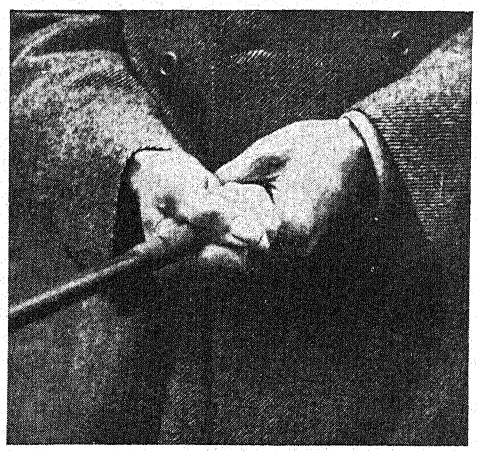
To begin the game, we must prepare to drive off from the teeing-ground. The first thing to do is to make a tee with a small handful of sand, pressing it together with the fingers to form a small pyramid. Upon the top of this the ball is lightly balanced, in order that the player may have a fair shot at it. Beginners usually like a rather high tee, while a practised player will use scarcely any.

It is important first of all to study the correct way to hold a club. It must be grasped in the fingers with both wrists above, and must not be held in the palms of the hands. A glance at the pictures on pages 3212 and 3213 will teach us more than any written description. In driving, the *left* hand is the guiding force, the master hand, and in taking hold of the club the left hand must grasp it first, and the right hand be afterwards placed below it in the position shown. In order to drive off from the tee we must stand in an easy position just

GOLF AND HOW TO PLAY IT



The right way to grip a golf-club is shown here. The club must be held in the fingers and not in the palms of the hands. The left hand guides the stroke.



This picture shows the wrong way to hold the club. The wrists here are not properly placed, and the position and grip of the hands are quite wrong.



Here we see a player standing in the correct attitude and addressing the ball before taking his drive.



This is a view of the player swinging back in driving, the wrists being held well under the club.

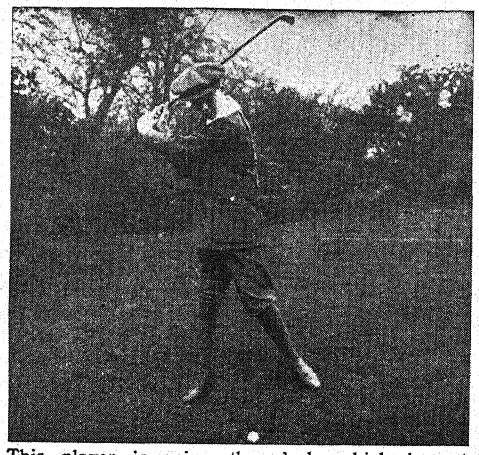


This is the wrong way to hold the club in swinging back to drive. The left wrist being over instead of under the handle, the player could not hit straight.

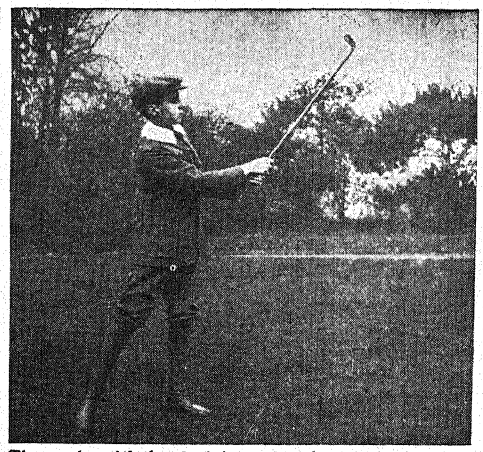


After striking the ball the club must continue its swing, ending behind the head, the weight of the body being transferred from the right to the left foot in striking.

A HEALTHY GAME FOR BOYS AND GIRLS



This player is using the cleek, which is not carried so far back before striking as the driver is.



The stroke with the cleek is carried through in the same way as with the driver, but not swung so far round.







These pictures show the stroke with the mashie, a club adapted for "lofting" a ball over an obstacle. In the left picture the player addresses the ball; in the centre he is swinging back for a full shot; and the right-hand picture shows the finish of the stroke. Note that the player keeps his eyes on the spot where the ball was.



The putter is used on the green for knocking the ball into the hole. The player is addressing the ball.



Here the player has struck the ball, which is about to drop into the hole, having run perfectly straight.

These photographs were taken at the Golf School, Royal Botanical Gardens, London, by permission of Mr. Norman Salmond, the manager.

opposite the ball, and at a convenient distance from it, with feet about a foot and a half apart, the weight of the body being distributed evenly between them. We must now "address" the ball, or act as though we were going to strike it, once or twice, to loosen the muscles of the shoulders and wrists, and to give us time to judge the distance.

Then, standing with spine straight and stiff, head and neck bent a little forward, knees slightly bent, and eyes fixed on the spot just behind and beneath the ball, we swing the club up and behind the back of the neck until it lies almost across the back of our shoulders. Our entire weight meanwhile is transferred to the right foot, whilst the left foot rises upon the toe with the left knee turned inwards. The backward swing thus taken finally blends into one long, continuous movement. With the forward swing the shoulders come completely round and the weight passes from the right foot to the left, the right foot rising upon the toe, and the right knee turning inwards as we sweep the ball off the tee in the course of the swing and follow its direction with the club, our eyes still fixed on the spot where the ball was for at least a second after it has been swept away. The finish of the stroke finds us in the position seen in the picture, with the right shoulder swung completely round and pointing in the direction in which the ball has traveled, and the club laid flat across our shoulders. The club, during the full swing of the drive, describes an almost complete circle.

In playing the approach shot, or shots, with cleek or mashie, the same principles of keeping the eye on the ball and the same backward and forward swing are employed, the latter, however, in a less degree, the club being carried up only as far as the shoulder instead of high behind the head, in a half or three-quarter circle only.

Taylor, the famous golf champion, impresses strongly on all his young pupils that the whole energies of the player must be concentrated on the stroke being played, and not wasted in worrying about past bad strokes. The situation must be thoroughly thought out before each stroke is taken, and a plan of campaign should be decided upon when a ball has to be got out of a bunker.

The ball having reached the green, the position in which the putter is to be held is a matter to be left almost entirely to the discretion of the player. Caution and steady play cannot be too strongly recommended when on the putting-green, and we should never attempt to hole out in one shot unless the distance be a very short one.

The etiquette of golf is very strict, and the following rules must be carefully obeyed:

A player going round the links alone must always give way to a properly constituted match. No player, onlooker, or caddie should move or talk during a stroke. Players looking for a lost ball must allow other players coming up behind to pass them.

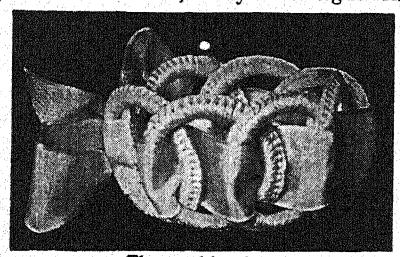
Turf cut or displaced by a stroke must be replaced in position at once. No player should play from the tee until the party in front has played the second strokes and is out of range, and we must never play up to the putting-green until the party in front has holed out and moved away.

Among the most important rules of the game of golf are the following:

When the balls are in play the ball farthest from the hole which the players are apprcaching shall be played first, each player keeping his own score, except in a match, when each player keeps his opponent's score. The ball must be struck fairly, not pushed, spooned, or scraped, under penalty of the loss of the hole. A ball must be played wherever it lies, or the hole must be given up; any *loose* stones or earth within a club's length of the ball may be removed, but the player may not move, bend, or break anything fixed or growing near the ball. Loose obstructions may be removed from any part of the putting-green. A ball shall be considered lost if not found within five minutes after the search for it is begun. If a ball is lost the player loses the hole.

A NOVEL NAPKIN-RING

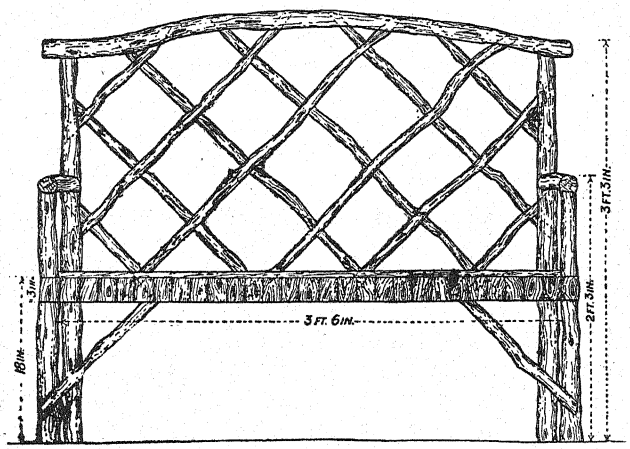
A DAINTY and ingenious little napkin-ring can be made in the following way. We get eight brass curtain-rings measuring about one inch across, a crochet-hook, a ball of lustrine, and about three-quarters of a yard of silk ribbon, just wide enough to pass through the rings without crumpling. The color of the thread should match that of the silk. The brass rings are first covered with the thread by crocheting over them. We first make a loop, then put the hook through the ring to make "an over," and then on the outside of the ring make an over, and draw this through the two loops already formed. When the ring is covered, and a neat, even chain shows round the outer rim, we draw the thread once through the last loop, pull it tight, cut it off, and work the end in and out with the hook so that it cannot come loose. We then lay the eight rings in a row, overlapping each other, and pass the ribbon through the second ring as it lies under the edge of the first one. Next we bring the ribbon over the edge of the first ring, and thread it through the third ring, as it lies partly under the second one. The picture shows how this threading is done. The ribbon comes out over one side of a ring after dipping under the opposite side. Having brought the ribbon through the last ring, we tie the two ends neatly in a bow. The ribbon may be quite thin, but it is well to get one with a corded edge, because it wears better.



The napkin-ring.

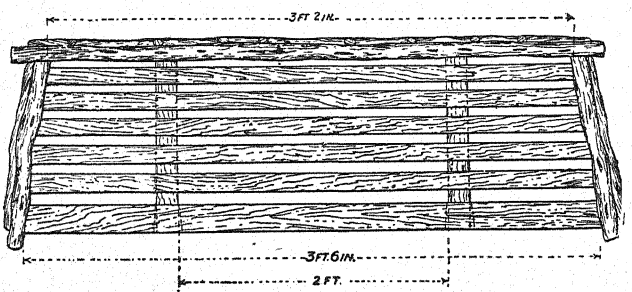
MAKING A GARDEN SEAT

A GARDEN seat is an object that can be made indoors at any time, in readiness for summer use on lawn or garden. It is very easily made and affords scope for various pretty designs, especially in rustic work, the materials for which can be obtained from a carpenter's shop or a neighbor's wood-yard. A pretty seat may also be made wholly of *slats*, or thin strips, on a framework of wood or of iron. Out of several designs one is selected and illustrated in this article.



1. A front view of the garden seat.

Pictures 1, 2, and 3 illustrate a seat in which rustic work is combined with a square framing. Picture 1 is a view looking from the front, picture 2 shows it as one looks down upon it from above, and picture 3 is an end view. This style of seat is selected because it is easier to make than one in which the framing is built of crooked pieces of timber. With squared wood one has no difficulty in getting the essential framing level, square, and strong, and we would have difficulty should we attempt to mortise and tenon or nail pieces of wood of all shapes together.



2. The garden seat as seen from above.

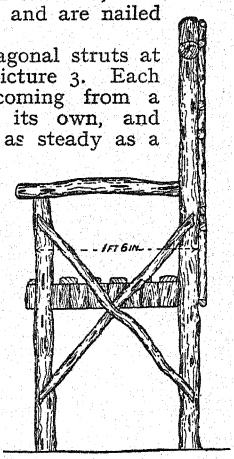
For the framing, which is seen in picture 4, we buy what is termed *quartering*, measuring 3 inches deep by 2 inches wide in cross section, which saves us the trouble of sawing it out of planks. We smooth it over with a plane and cut off lengths as shown, which, of course, we may make longer or shorter as we please. The method of fitting only is important. There are two sides, two ends, and two middle stretchers.

The framing for the seat has to be fitted to four uprights, which can be made of quartering or of fir-pole, as shown in the pictures. The fitting of these must be good, or the seat will be unsteady. At 18 inches from the bottom, flat faces will be cut on the uprights at right angles with each other, and on these mortises will be marked and cut, as shown in picture 4. Tenons will be cut on the ends of the seat quarterings to fit these mortises very tightly. The end of each tenon will terminate at an angle of 45 degrees, termed a mitre. These ends will abut within the legs, and this abutting contributes very much to the steadiness of the fitting. The legs of kitchen tables are fitted in exactly the same way. After being fitted, the tenons and mortises are well brushed with white-lead paint, driven in tightly and well screwed or nailed. Previous to this the central stretchers will have been fitted into place and wedged as shown. This completes the only troublesome part of the work. The remainder can be made of rustic material in any way we may desire.

Two pairs of sloping pieces or angle-struts are shown supporting the middle part of the seat in picture 1. These are nailed to the front and back pieces of quartering and to the legs. Elbow-rests, as seen in picture 3, formed of round poles, each being slightly flattened on one side, are tenoned into the back uprights and are nailed upon the front ones.

We must also fit diagonal struts at the ends, as seen in picture 3. Each resists the pressure coming from a direction opposite to its own, and thus renders the seat as steady as a rock. They are made of rustic branches cut to angles of 45 degrees at the ends, and nailed or screwed, preferably the latter, to the legs.

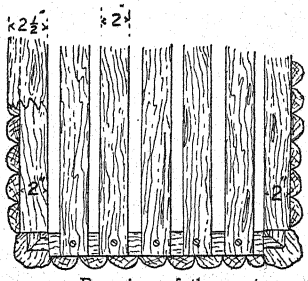
The back can be made of a crooked branch, not necessarily of the shape shown, and nailed or tenoned to the back uprights. It will be stiffened by the crossing rustic work



3. The end of the seat.

at the back, the appearance of which may not be just like the drawing, but will depend on the shapes of the material which we can procure. These may be nailed or screwed, but screwing always makes a firmer job.

The seat is made of six slats of ½-inch or ¾-inch board, which may be purchased cheaply at the sawmill, or they can be sawn out of match-boarding. Oak is best, but pine will do. They are nailed with openings between to allow the rain to run away, and are slightly rounded on the top for the same reason. Here the essential work of the seat is finished. But its rustic appearance may be much improved by nailing short lengths of half-rounds all around the edges of the quartering, as shown in the illustrations. They will extend from the top of the slats to about 1 inch below the quartering. Or if straight pieces of half-round branches can be procured, these can be used with good results, one in front, one at back, and one at each end. They are very much less troublesome to fit than the smaller upright pieces.



4. Framing of the seat.

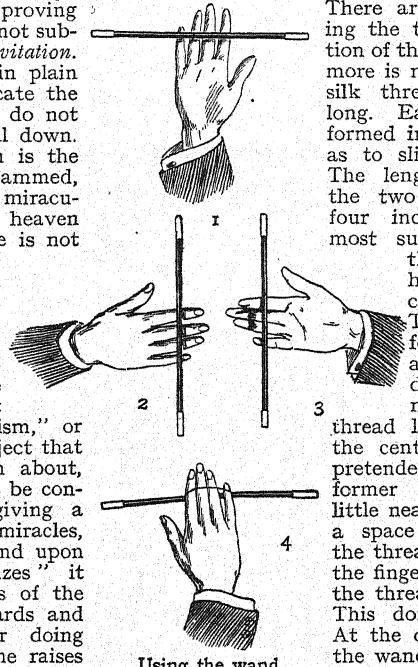
The whole seat may be painted any suitable color, but a clear varnish, applied with a brush, is preferable, as this leaves the wood its natural color.

THE SELF-SUSPENDING WAND

THE young conjurer has seen on page 3114 how to make a magic wand and to produce it, in a magical way, from his purse. But it may not always be convenient to do this. He may not have the right sort of purse, or his purse may be so full, say, at Christmas time, as to leave no room for the wand. In such a case he may be glad to be able to give some other proof of its magical qualities, and one very good way of proving them is to show that it is not subject to the *attraction of gravitation.* These are big words, but in plain language they merely indicate the familiar truth that, if you do not hold a thing up, it will fall down. The only known exception is the coffin of the Prophet Mohammed, which was said to hang, miraculously suspended, between heaven and earth. Even that tale is not true; but, anyhow, the young conjurer can work a similar miracle on a humble scale with the aid of his magic wand.

A good way of introducing the trick is to make a few remarks about what is called "animal magnetism," or mesmerism. This is a subject that nobody knows very much about, so that one is not likely to be contradicted. By way of giving a practical illustration of his miracles, the performer lays the wand upon the table and "magnetizes" it by drawing the finger-tips of the right hand lightly backwards and forwards along it. After doing this for a few moments, he raises the hand. The wand comes with it, as shown in the first picture, as if held up by some magnetic force. He waves the hand about, but, to the astonishment of the onlookers, the wand does not fall.

Tilting it into an upright position, as shown in picture 3, he removes the second and third fingers, leaving it in contact with the fore and little fingers only. Thence he transfers it to the left hand, and, to make the matter still more surprising, shows that it will hang just as well from the backs of the fingers, as shown in picture 2. After a minute or two he pretends to feel that the magnetic influence is getting weaker, and presently the wand falls to the ground. He picks it up and offers it for examination, but the closest inspection fails to discover anything to account for its very surprising behavior.



Using the wand.

There are various ways of working the trick, but for the production of the effects described, nothing more is needed than a bit of black silk thread, about seven inches long. Each of the ends must be formed into a loop, of such a size as to slip easily over the wand. The length of the silk between the two loops should be about four inches; the exact length most suitable will depend upon the size of the performer's hand, and must be ascertained by experiment. To prepare the wand for use, the two loops are passed over it and drawn apart, the intermediate portion of the thread lying straight along it at the centre. Under cover of the pretended magnetizing, the performer brings the two loops a little nearer together. This makes a space between the wand and the thread, and presently he works the fingers of the right hand under the thread, as shown in picture 4. This done, all the rest is easy. At the close he has only to draw the wand through the hand, thereby sliding off the thread, which may be allowed to drop on the floor.

At a distance of three or four feet the thread, by artificial light, is quite invisible, and no one among the audience would be able to detect it. The performer must, however, always take great care to keep the two loops on the black portion of the wand, and the back of the hand turned away from the spectators, in order to ensure success.

A LITTLE VEGETABLE GARDEN

WHAT TO SOW AT THE END OF APRIL

OUR chief concern must still be seed sowing, and something that is very useful to grow, and does not need much space, is parsley. Parsley should have a deep, well-worked root-run, and the seed should be thinly sown. It does not come up quickly, therefore it may need watering if the soil gets very dry.

What herbs shall we grow? First and foremost there may be thyme—sweet smelling, and always in demand in the kitchen. It flourishes in a warm, sunny position. Sage may also find a place, and is sure to be wanted when ducks are to be cooked and stuffed. We shall not require many plants of this, as they grow to a large size, and one will supply many twigs.

Another useful herb is mint, or peppermint, and here, too. a couple or three well-grown plants will, in all likelihood, be found sufficient.

Some of us may want to grow potatoes. One of the first questions as to their cultivation, naturally, is: When should they be planted? The planting season for this vegetable is a long one. Roughly speaking, in different parts of the country it extends from March until May. Much depends upon the kinds of potatoes grown, and it may be said that those potatoes that are to be eaten as new potatoes, which are dug from the ground as they are required, may be planted earlier than is necessary for those that are to occupy the ground until autumn, when they are dug up and stored for winter use. On the whole, the potatoes that are dug up early, the new potatoes, will be the more convenient for our little gardens, because they occupy the ground for a much shorter period. Generally speaking, in all districts these should be planted by the end of March, but the fear of frost cutting the tops when they have appeared through the ground makes it necessary to plant according to weather and district. The main crop of potatoes may be planted now or later; good crops have even been grown from tubers put in as late as June.

Now comes another question: How deep shall we put them in? This is a question on which there are many opinions, some say three or four inches, other say five at least; and each row must be a foot and a half to two feet apart, those grown as new potatoes the first-mentioned distance or even a little less, and the tubers themselves about eight inches from each other in the rows for new potatoes, and a foot at least if for late ones.

We must not forget our potatoes in frosty weather when they have peeped through the ground, for the young shoots are decidedly tender; if there are but a few plants, it may be possible to arch them over with sticks, and throw some sacking over on frosty nights. But if the frost should catch them, it is an excellent plan to be before the sun and sprinkle them with cold water, but it is of little use to do this if the sunshine has already reached them.

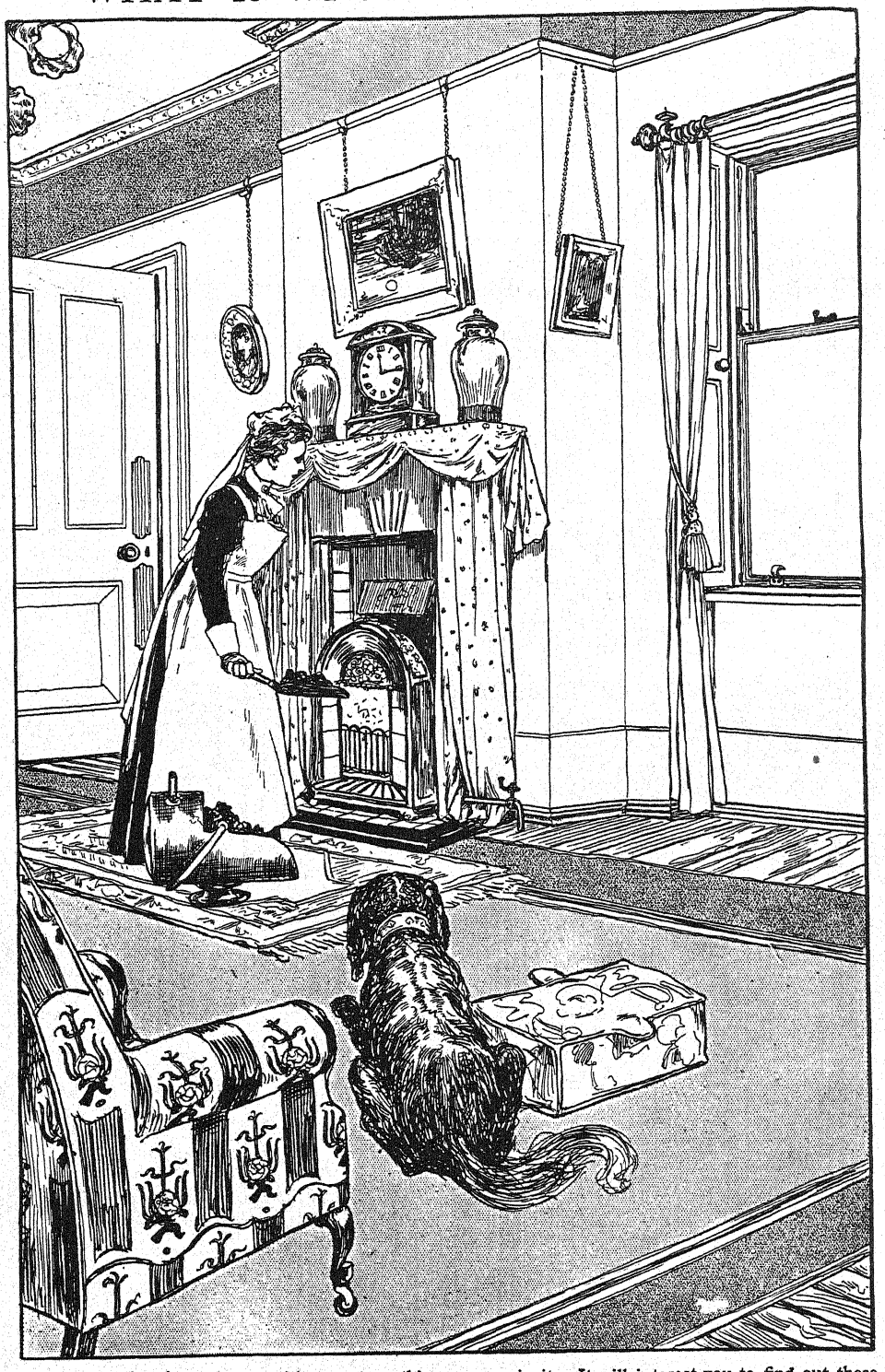
There is another hint that must be given here. When the plants are well above the ground, and have made a few inches of growth, we may carefully bank the soil up around them on both sides.

Some of us will, no doubt, wish to grow rhubarb. We have to remember that when in full summer growth it requires ample space; all the same, it is a profitable and highly satisfactory crop to grow, and the plant is a bold, handsome one. Young plants may be put in during April, and the sooner the better. If dry weather follows the planting, a good watering should be given occasionally. String (or snap) beans may be planted if the weather is warm. They should be placed several inches deep, and a foot apart, for the bushes of the dwarf or "bush" varieties grow strongly; beets and carrots and oyster plant may go in, too, in long, shallow drills covered lightly, but pressed firmly into the soil with a board, and we must be careful not to pull out the seedlings of the last plant, thinking that they are grass blades, for they closely resemble upshooting grass. Second plantings of peas may follow, and also lettuce. Then the early varieties of sweet corn or maize must now be sown. These are generally dwarf, and the grains may be planted rather sparsely, and rather deeply in long rows. Or they may be grown in hills, four or five grains being dropped in each hole, and the hills at least a foot apart.

So far celery has only been mentioned, but to grow celery may indeed be the ambition of some young readers. For an early crop the seed is sown in a greenhouse or on a hot-bed, but as young gardeners often have to dispense with these, it is the later celery crop that we must attempt. The seed may be sown out of doors now, on good ground which has been deeply dug and manured. We must watch the seed carefully, and when the seedlings appear not let them suffer for lack of moisture. The great secret of having a good crop is to keep the plants always growing, they must not stand still, as it were, and it is very necessary to keep them clear of weeds. Later on there is transplanting to trenches, then, still later, an operation known as *earthing up*, and we must remember that it is a little difficult to grow this crop really well—all the more credit if we succeed.



WHAT IS WRONG IN THIS ROOM?



This picture has been drawn with seventeen things wrong in it. It will interest you to find out these mistakes and write them down, comparing your list with the correct list which appears on page 3328.

THE NEXT THINGS TO MAKE AND DO ARE ON PAGE 3321.



THE JAGGED SKYLINE OF NEW YORK CITY. A SUBJECT WHICH ATTRACTS THE ARTIST



New York City's unique skyline, whose pinnacles and towers, rising and falling like mountain peaks against the sky, have proved an interesting subject for the artist and illustrator. This picture shows some of the tallest buildings in the world, with a beauty and magnificence all their own. In the middle of the picture is the Woolworth Building, 55 stories high, 793 feet, the highest inhabited building ever constructed. At the extreme right of the picture looms the huge Municipal Building, 34 stories in height, covering over two acres. Just back of it is the Park Row Building which faces the Post Office and rises far above it. To the left of the picture the building with the pyramid top is the Bankers Trust Company Building, an elegant structure, opposite which is the old U. S. Sub-treasury, a fortress, fully armed and equipped. Next to the Bankers Trust Building are the Equitable Buildings, housing one of the largest Life Insurance Companies in the world. At the extreme left-hand corner of the picture is the tall building occupied by the Adams Express Company. The long piers in the foreground look very diminutive in comparison with these sky-scrapers of New York, standing in such a jumbled but artistic confusion of peaks and angles.

WHAT THIS STORY TELLS US

CHILDREN are considered much more important now than a hundred years ago. This story tells some of the things which one great city is doing to help its children to become strong men and women. The schools are of course important, but we shall see that many things besides instruction are offered to our children; for it is of little use to teach a child who will grow up into a hopeless invalid. Besides the schools, the libraries are one of the most important means of education in the city. The little immigrant children are more eager to get an education than those whose parents were born in the United States.

WHAT A GREAT CITY DOES FOR CHILDREN

CONTINUED FROM 3124

IN our Wonder Book, some one asks the question, "Will children rule the world?" and the Wise Man tells us why it is that the children mean so much to the welfare of a nation. They are the men and women of the future. People did not always think of this. In the days of which we read in our story of "Colonial Children" it was believed that children's wills must be broken, their minds and bodies completely subjected to their parents. A child was merely an unregenerate little being who "must be seen and not heard."

THE NEW VIEW OF THE IMPORTANCE OF THE CHILD

To-day the world is awakening to the supreme importance of the child. It is beginning to realize that in the hands of the children will some day rest the government of our nations and the making of our homes, and that if we wish the United States to continue a strong and mighty republic, we must carefully look after the training of our children. New York, Boston, Chicago and many other of our large cities have found that if they would have healthy-minded, wholesome-bodied citizens they must see that the minds and bodies of their little ones are properly cared for—that the children are properly fed, and clothed, properly housed and properly taught, or else the well-being of the child and of the community will suffer. The parents in many cases are too ignorant or too poor to do these things for their children.

New York City, with its ever-changing, ever-growing population of immigrant children, has a particularly hard problem to face, and in many ways its government has responded nobly to the crying need for child training.

WHAT THE PUBLIC SCHOOL DOES FOR THE CHILDREN

It has a system of public schools, which, though perhaps not all that it should be, still accomplishes wonders with the children with whom it has to deal. It takes many of them from dirty, crowded, poverty-stricken tenements, and undertakes to lay a firm foundation for good citizenship and good home making. Children enter school with no knowledge of English, accustomed to the squalor and filth of the tenements. In a few years they leave the school, but with what a difference! They have been trained in personal cleanliness, and many have responded to the training; they have learned the language and have a fair knowledge of the land in which they live—and they are proud of their knowledge, proud of their school and their teachers, and above all proud of the great United States—the country of their adoption.

THINGS STUDIED IN THE SCHOOLS

The public schools try every means to help the children of the city to grow

Copyright, 1911, 1918, by M. Perry Mills.

स्व० श्री बेनीप्रसाद टंडन

रानीमंडी, इलाहाबाद

into good and useful citizens. Besides the subjects that we usually call "school lessons," the boys are taught carpenter work, and the girls cooking and sewing. They have calisthenic exercises and gymnasiums to make the children's bodies strong, and school doctors and nurses examine them to see that eyes and ears, teeth and noses and throats are healthy.

Many children have to work before they can go through the high school, but if they are ambitious they may attend high school classes in the evening and there carry on their studies. Above the high schools there are two great colleges, one for boys and one for girls, where, as in all the city schools, books and tuition are paid for by the city.

MOTHERS' MEETINGS AND THE LITTLE MOTHERS' LEAGUE

So that they may better understand the children, the teachers of the public schools try to work with the fathers and mothers. For this purpose, Mothers' Meetings and Parents' Associations have been organized, and at the meetings, parents and teachers talk about the children and discuss the best way to bring them up. Some of the parents themselves need to be taught and are asked to listen to talks by doctors or well-trained nurses.

The grown-up mothers, however, are not the only means by which the little ones are reached. An association called "The Little Mothers' League" has been formed of the older sisters who often have entire care of the babies, and in many cases these "little mothers" are found to be more easily taught than the mothers themselves. Sometimes mothers, who will not listen to the nurses, will learn at home what their little daughters have been taught.

In the summer, the schoolhouses are used as meeting places where interesting talks are given one afternoon a week to the "little mothers" by doctors and nurses. They are told about the best foods for the babies, and shown how to prepare food, and keep the bottles for their little charges clean. They are shown how to bathe and dress the babies and are taught the importance of fresh air and cleanliness.

A LITTLE GIRL'S IDEA OF HOW TO TAKE CARE OF A BABY

That the little mothers take these lessons to heart was proved by the short essays which some of them wrote at the close of a series of lectures. One little girl said:—

"Do not dress the baby warm in summer. Put very little clothes on it. The best food for the baby is barley water. When it is sick give it a dose of castor oil. You must nurse the baby according to how old it is. Bathe the baby every day. Sponge it every minute. Do not give it any fruit or grocery milk. Do not give it any apples, or pickles, or watermelon, or any of that kind of stuff, because the baby will die."

Each girl belonging to "The Little Mothers' League" wears a badge as a token of membership; and the president of each group wears a gilt badge which is looked upon as a mark of high honor.

VISITING NURSES AND PHYSICIANS

The city hospitals, and as we have said before, the public schools in New York City, have physicians and visiting nurses connected with them, who go to the homes of the children. Many of the mothers are grateful for help; but some of them do not understand the need for cleanliness and proper food. For instance, a nurse told of one baby, who during one day had been fed on watermelon, potatoes, pickles, and practically everything else at hand except the milk which should have been its only food. In another case the nurse found a tiny baby lying in a basket by the side of the stove, sucking a piece of cornbeef. "Why did you give the baby cornbeef?" asked the nurse patiently, as she gently unclasped the baby hands from the indigestible morsel.

"Well, and what would you have me give him?" returned the mother crossly. "He don't like pork."

HOMES, FOR SICK CHILDREN, BY THE SEASIDE

Sometimes it is necessary, in order to save a little one's life, to take it from its home for a time, and for these poor children, homes like the Sea Breeze Tuberculosis Hospital and the Home for Sick Babies at New Dorp have been founded.

The Sea Breeze home is built upon Coney Island and contains many of the little ones who have been seized with that terrible scourge of ill-nourished childhood, bone tuberculosis. Here hundreds of little cripples from the tenements of New York City, whose lives would be

FROM ELLIS ISLAND TO CITIZENSHIP



From the poor, timid little strangers entering the country through Ellis Island, to these rugged little Americans working away at their garden plots, is quite a step. This is one of the garden blocks in the upper part of New York City, where the children, under trained instructors, learn gardening.



The little immigrant children landing at Ellis Island, the gateway to New York, have their Christmas tree like any otner little Americans. Here we see a group of little Italian youngsters proudly displaying the gifts that Santa Claus, in the form of a United States official, has brought them on the glad holiday.

otherwise hopeless, are given a chance in the open on the seashore, summer and winter alike, until the healing forces of nature have done their work.

Mr. Jacob A. Riis introduces us to one or two of the brave little inmates of Sea Breeze in person.

"Here is five-year-old Max Gross," he writes, "child of poverty and want, all the days of a long and weary year strapped to a frame that holds his little body rigid because his back is not like the other children's. Yet ever cheerful, never hopeless, calling across the room to the doctor, 'I am all better!' Poor little chap! Once and only once, his tears fell; and when his nurse went to him in alarm he sobbed out upon her sleeve that some one had said on the porch as he was carried by, 'Max will not get better.' 'And I don't want to get dead and be an angel,' was the cry that wrung the nurse's heart. 'I want to get off my board and play first!'

All the days are spent in the open at Sea Breeze—even the school is a tent, and very cold weather only shortens the time given to lessons. Of course in the case of these sick little ones, the time spent in school is always short.

THE HEALING CAMP ON THE SCHOOLHOUSE ROOF

But all the little consumptive children of the slums cannot be taken into the seaside homes, so roof camps have been established where the children can spend the days in the open air. The patients arrive at the camp each morning at nine o'clock and are at once given to drink a glass of fresh milk with a raw egg beaten into it. Then the children have their lessons almost as they do at school. At noon a plain, wholesome dinner is served, and in the afternoon another glass of milk with a raw egg is given. Promptly at five o'clock the camp closes, but the unhealthful conditions of the home are not allowed to spoil the good effects of the open air. "Nurses and physicians visit the tenements and see that the lightest, airiest room is given to the patient. They see that the linen and eating utensils of the patient are washed separately and give tickets for two quarts of fresh milk and three raw eggs a day. The day camp is one of the many wise agencies provided by New York City in the struggle against the great White Plague."

PLAYGROUNDS IN THE AIR

But after all, though it is wise and kind to help the sick ones back to health, the real hope of the country lies in healthy children who will grow up to be strong men and women. The city realizes this, and has set itself to the task of keeping the well children robust and happy, and providing them with wholesome employment for their brains and bodies. For this purpose, it has established open air playgrounds, roof gardens, recreation piers, bathing pools, garden plots, and athletic grounds, and has secured jolly, wholesome young women and men to teach the children how to play, for unhappily many children of the crowded streets do not know how to play even simple games, and must be taught.

The settlement workers among the children of the slums count the roof gardens as one of their most valuable helps. All the newer public schools in New York are built with roof playgrounds, enclosed with wire netting and floored with tile. Here the children learn baseball and basketball and even tennis, and perhaps in the evening there are gymnasium classes and dancing classes.

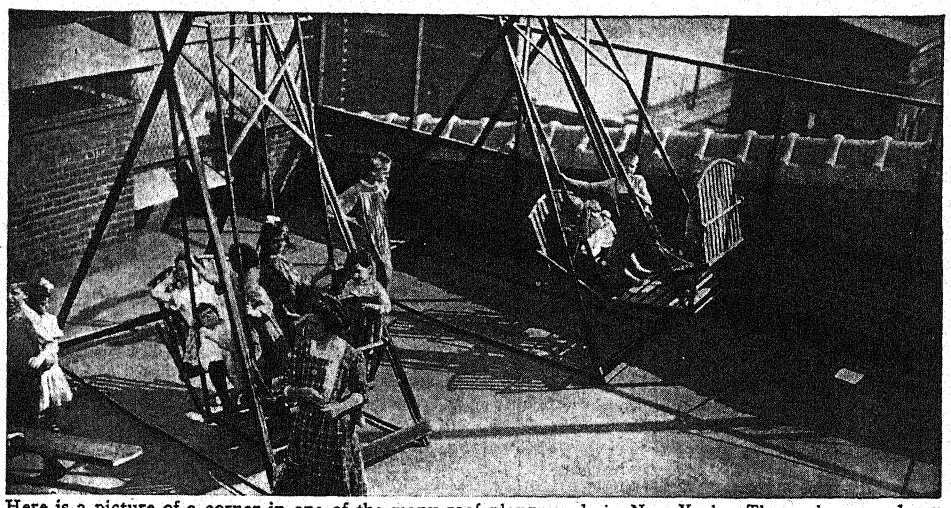
Many of the model tenements are built with roof gardens, and many of the Day Nurseries of New York City have summer roof gardens, where the little ones left in the care of the nurses can play in the open air until that best of medicines begins to bring the pink glow of health to their pale cheeks. On the roof gardens the children find swings and hammocks and "shoot the chutes," and flowering plants for whose growth and care older ones are sometimes made responsible.

THE PUBLIC PLAYGROUNDS

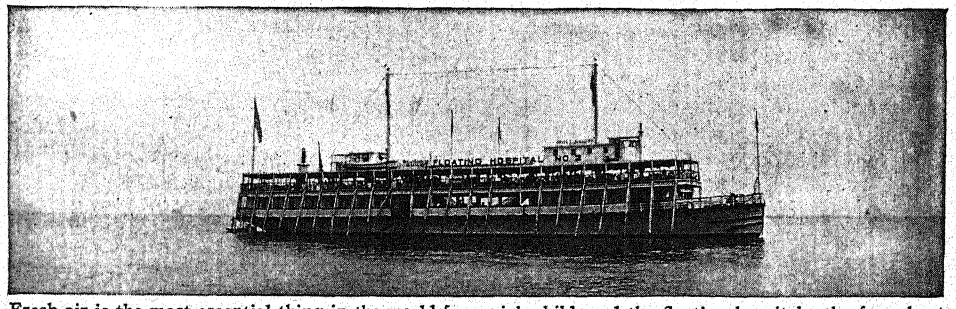
Then there are the playgrounds where a fellow can play ball just as much as he likes without being taken up by the "cop," where there are swings and rings and bars and trapezes and tennis courts and sand piles, and other delights. From the oldest boy and girl to the littlest of the little folk there is something for all to do—and all this away from the dust and clamor of the hot streets.

The value of the public parks as playgrounds has also been recognized, and in the spring and early summer the children of the schools are taken to picnic

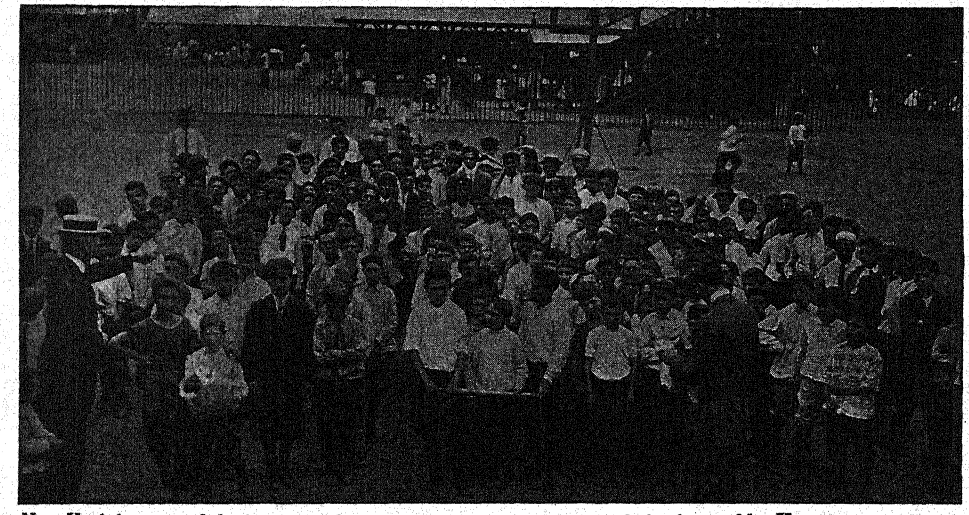
FRESH AIR AND FUN FOR THE CHILDREN



Here is a picture of a corner in one of the many roof playgrounds in New York. These playgrounds on the roofs of city schools, far above the hurly-burly of the city streets, and out of reach of its dangers, provide happy, healthful places of amusement for the little children of the slums.



Fresh air is the most essential thing in the world for a sick child, and the floating hospitals, the ferry-boat schools and the seaside homes that New York City and its charitable organizations provide for its suffering little ones, bring health and rosy cheeks to many who would otherwise die.



New York has one of the best organized systems of public playgrounds in the world. Here we see a group of lads under the care of two of the city game teachers. Base-ball, basket-ball, and tennis, are among the games taught the boys. Sad to say, children of the crowded streets often have to be taught to play.

there and it is there that they give exhibitions of folk-dances. Teachers go to the big public schools to teach the children how to dance the dances that their fathers and mothers and their forefathers for generations danced perhaps in far-off Russia, or in Poland or Italy or Germany. Many of these children were born in Europe. Perhaps the first thing that makes them feel they are at home is the dancing class in the big gymnasium where, as far as possible, the children are taught the dances of their own nationality. This helps them to forget that so much about them is new and strange.

The public parks, too, are often the scenes of games by boys and girls in flag drills and other forms of patriotic plays. So the old is linked with the new and the little foreigners at last begin to feel that they are really American citizens.

RECREATION PIERS

Dancing is taught also at the recreation piers, which have been built at various spots along the Hudson and the East Rivers as breathing spaces during the summer for the children living in the hot crowded tenement districts of the big city. These piers are open from May to September and there is a concert on each pier every evening from eight to ten.

PUBLIC BATHS AND SWIMMING POOLS

For the hot dog-days the city, moreover, provides an elaborate system of free baths and swimming pools for its boys and girls, where they can swim and splash about in the cooling water to their hearts' content. Teachers are provided to give the children lessons in swimming and diving and other water sports, and the children in their play learn the real value of cleanliness.

THE LIBRARY'S PART IN MAKING AMERICANS

Thus New York City builds up and trains sound bodies for its boys and girls, and what does it do for their minds? We have spoken of the training of the public schools with their classes in domestic science and the trades. The public library takes up the task of training where the public schools leave off. All of the New York libraries have children's reading rooms and tables and wee chairs for the little ones. Many of them have a weekly story hour when a trained story teller tells well-beloved tales to the children. These story hours are usually separated into two divisions—fairy stories for the wee tots and hero tales for the older boys and girls. Often only some exciting bits of a story are related and the story teller stops short with these words: "And the rest of the story can be found in the books on the library shelves." And so a taste for the best reading is cultivated in the children.

Patriotic stories are in particular demand, and the "Washington books" and the "Lincoln books" are positively worn to shreds in the libraries of the lower East Side, by the little foreigners who are eager to learn of the brave men of their new adopted country.

But eager though the child may be to receive reading matter, there is a hard and fast rule that no books may be taken out by little people unless their hands are clean.

"Three minutes after school is dismissed in the afternoon the line begins before the library desk. Ten minutes, and it reaches across the room. Fifteen minutes and it is down the stairway to the door and into the streets. The longest line on record is accorded the Seward Park library branch, where fifteen hundred children with eager faces have been counted draping the stairway and winding around the building and three blocks about the square, all patiently waiting 'to give themselves in to take libraries.'"

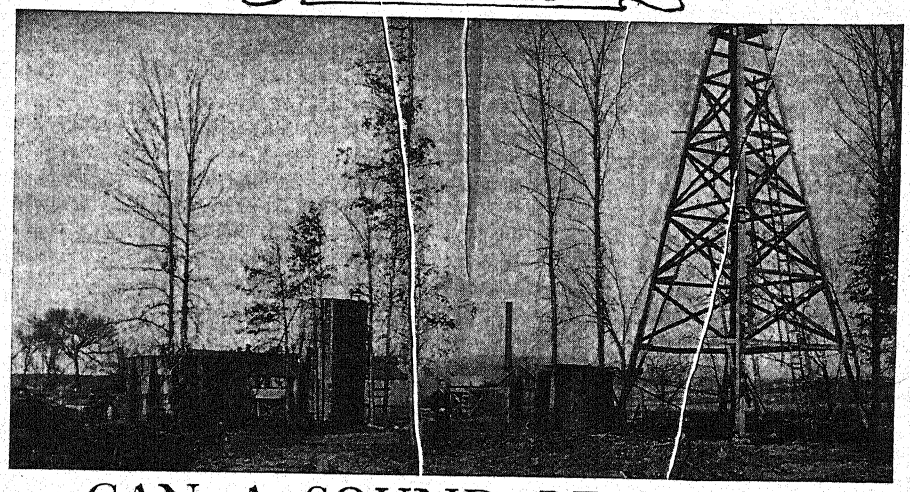
When the hands are pronounced satisfactory the children pass into the reading room. Boys and girls just "joining" the library are asked to sign a pledge which reads as follows: "When I write my name in this book, I promise to take good care of the books I use and to obey the rules."

Upon being asked what that means one little girl showed she had a thorough understanding of the matter.

"It means to wash your hands always before you read a book, and not to let my baby tear it."

And so the lesson of cleanliness and the delights of fairy land go hand in hand. It is said that in New York City more than one-third of its millions of library books circulate among the city children.

THE NEXT STORY OF THE UNITED STATES IS ON PAGE 3489.



CAN A SOUND BE FELT?

CONTINUED FROM 3150

WHEN we come to think of it, we shall see that hearing is, after all, only a special kind of feeling, and so also are smell and taste and sight; but when we say, "Why cannot sound be felt?" we mean, "Why does it not affect our sense of touch?" The answer simply is that almost all sounds are too delicate a movement of the air for our sense of touch to feel. Otherwise, there is no reason, of course, why we should not feel them. In some people, whose brains are not quite well, any or all of the senses may become far more acute than they usually are, and such people can do things which it is very difficult for us to believe until we study the subject. Some of these people can apparently feel certain sounds with their skin; only, of course, they do not feel it as sound, but as a trembling movement in the air. The very lowest sounds can be felt as well as heard by ordinary people. The lowest pitched sound that we can hear is one made by about fourteen to-and-fro vibrations per second. It is possible to make a large, long, heavy tuning-fork which, when it is hit hard with a drum-stick, will vibrate at this very slow speed. If a person's hearing is quite healthy, he can just hear this as a very faint and deep note; but it is quite easy also to feel the waves of air that it makes—that is, to feel them by the sense of touch just as they can be felt by the sense of hearing.

ARE THERE SUCH THINGS AS GHOSTS?

There are many things in the world which we do not know, and no one has the right to deny that there may be thinking and intelligent beings of whom we know nothing. But it is quite certain that there are no such things as ghosts.

In all ages a certain number of people have believed in ghosts, and this is not difficult to understand, since we know what tricks our brains may play us. In certain states the brain may quite easily make us think we see things that are not there, or hear voices which do not really exist. These mistakes have a long name which does not matter. I believe they are much commoner than we usually suppose, because most of the people whose brains make these mistakes say nothing about them. Also, if people believe in ghosts, it is very easy for them

to think they see a ghost, when what they see is something else which they mistake for a ghost. This belongs to another class of brain mistake—in which there is really something there, but it is not what we think it is. In pictures or descriptions of ghosts, we find that they always wear some kind of clothes. That one thing is enough to show how absurd the belief is. In any case, our souls, or ourselves, are not material things having the same shape as our bodies, but even if they were, what could be more absurd than to believe that there are such things as the ghosts of clothes?

SHOULD WE SEE THE WORLD GO ROUND IF WE STOOD STILL IN A BALLOON IN THE SKY?

Yes; and we should have a wonderful spectacle beneath us, for we should see the earth spinning under our eyes at a pace twenty times as quick as an express train. Also, if we went up in the daytime, the night would not come; and if we went up at night, the day would not come; for, whatever our position was in relation to the sun, there we should remain. But all this is quite impossible for a balloon which floats in the air, for the air is carried round with the earth, and the balloon must go round too.

It would be possible in an airship which could travel as fast through the air in the opposite direction as the air travels with the earth; as fast as the earth and the air spun one way, the ship would beat against them. So, of course, it could remain in really the same place, and the people in it could see the earth travel underneath them. But the earth is 25,000 miles round, and spins completely round in twenty-four hours, so the airship would have to be able to move at a tremendous pace, about ten times as fast as the fastest motor-car.

WOULD THERE BE ANY WEIGHT IN THINGS WITHOUT THE EARTH'S PULL?

The answer to this is practically no. What we call the weight of things is the earth's pull for them; and if the earth were to lose its power of gravitation, it would be just as easy to lift a house as to lift a little ball. The amount of matter in things would be just the same as it was before, only they would have lost their weight, or heaviness. So, when we mean to talk about the amount of matter in a thing, it is very much better to use the word "mass" than to use the word weight. The mass of a thing is wholly independent of gravitation, but the weight of a thing wholly depends on gravitation, and cannot exist without it. The mass of a thing is the same whether it be on the earth or the sun or the moon, but its weight would be vastly different in those three cases.

I said that the answer to the question was practically no, but it is not *quite* no, because there is another source of weight in things besides the earth's pull, and that is the sun's pull. Also, there is the moon's pull, and, indeed, the pull of all the other matter in the world everywhere. These other bodies are, however, comparatively so far away that though things would still have some weight owing to their pull, even if the earth's pull were abolished, yet we should scarcely be able to measure it, and certainly could not feel it with our hands. If all gravitation were abolished, nothing would have any weight.

HOW DOES SOAP MADE FROM FAT GET FAT OUT OF CLOTHES?

If soap were all fat, it certainly could not get fat out of clothes. Indeed, just in so far as there is any fat in soap, it is so much the less useful a cleanser. Therefore, there is never any fat in soap except in soaps which are specially made for use on people's faces. Soap is made from fat, but the fat is decomposed in making the soap. The fat is split up, and a certain part of the fat molecules is combined with the metals sodium and potassium, and that is soap.

Soap melted in water makes a mixture which, especially when it is warm, melts fat out of things and helps to carry it away; but the soaps which are the most effective cleansers contain a large quantity of potash or soda in them. This "free alkali," as it is called, makes the soap a very good cleanser, for it partly decomposes the oils and fats in things, and so helps to dispose of them. There is a great deal of free alkali in soft-soap. There are soaps of other kinds which are good for cleansing such things as metal surfaces, but have quite a different composition, and will not get fat out of clothes—"won't wash clothes."

DO PARROTS KNOW WHAT THEY ARE TALKING ABOUT?

I believe that no parrot knows in the least what it is talking about. The parrot has keen ears and a clever brain,

so that it hears very distinctly words uttered in its presence, and so that it can reproduce with its throat and tongue and beak many of the sounds which it so cleverly hears. Of course, this is a very different thing from an echo, but so far as attaching any meaning to the sounds is concerned, parrot speech is only echo speech.

Small children reproduce words which they do not understand in just the same way, and I am afraid that grown-up people do so, too, sometimes. If we could believe that a parrot understood what it said, we should have to put the parrot on something like our own level in the scale of being. But we find that all words are just the same to a parrot, and it will repeat a word like algebra, shall we say, or hypnotism—if it hears it often enough—just as readily as it will repeat "pretty Polly." It is just a living echo, and no more, and the process that goes on in the parrot's brain is no more and no less than what goes on in our brain when we simply imitate or repeat the sounds of words spoken to us in some foreign language of which we know nothing.

IS IT CRUEL TO BURDEN HORSES?

This entirely depends on the amount of weight that we make the horse carry or draw. There are two ways in which we may be sure that it is not cruel to burden horses within proper limits. One is, that it is pleasant to every living thing to do what it is fitted for, so long as it keeps within the limits of its powers. If someone were to come from another planet, and were to see men playing football or running races, he might say that this must be very cruel, and ask who it was that compelled men to do these things; but the truth is that men enjoy using their muscles, just because they have muscles, and muscles are meant to be used.

People who drive horses know that the horse enjoys the drive as well as the driver, and that makes our second reason. No doubt, a horse would rather run without having to pull something behind it, but as long as it is well cared for and rested, I am sure that the horse is very happy and contented at its work. None of this means, however, that we are right to treat horses as we do only too often. I think that if we were not accustomed to it, and if we really thought about it, we should look upon the spectacle of horses drawing a heavy omnibus as not at all nice; and even that is not nearly so bad as many things which horses have to do. I also think that it is very bad for ourselves to use other living creatures for our purposes unless we are very careful how we do it. So I am glad that we use motor-cars nowadays, for with them we can be quite sure all the time that, however we treat them, we are not causing suffering to a creature that lives and can feel joy and pain.

DOES IRON INCREASE IN WEIGHT WHEN IT RUSTS?

We have to find out what happens when iron rusts, and then we shall have the answer to this question. What happens when iron rusts is, that the outside of it, which is exposed to the air, is burned, or oxidized. A certain amount, therefore, of the oxygen of the air is added to the iron. This oxygen, like everything else, has weight, and its weight must be added to the weight of the iron itself when the iron is rusty. Therefore, the answer to the question must be yes. The iron increases in weight by the weight of the oxygen which it has added to itself. But, as everyone knows, the rust, or *iron oxide*, is friable, a Latin word which means crumble-able.

The rust will crumble away under the influence of water or wind or anything else rubbing against the iron, and so the iron thing will lose not only the oxygen that it has taken into itself, but also the part of the iron which has combined with the oxygen. So an iron thing, when it rusts, loses weight, and that is very serious, of course, for it means that the thing loses its strength. And if an iron or steel bridge were allowed to crumble away in this fashion, it would soon break. That is one reason why we must keep such a bridge painted to protect the iron from the air.

WHY DO THINGS FADE IF THE SUN SHINES ON THEM?

When such a thing as a curtain or a piece of cloth fades, it is because the chemical substances in it that give it its color have been partly destroyed. Most of this coloring matter consists of substances which can be burned, or oxidized, and if a thing is exposed to the air, of course there is plenty of oxygen round

about it. The sun's rays destroy the color, because they help on this chemical change that we call oxidation. Every photograph is taken because of the power of the sun's rays to produce chemical changes, and the fading of a piece of cloth exposed to the sun is really very much the same as what happens in a photographic plate. The part of the sun's rays which has this chemical power is the part which produces the colors of blue and violet when it strikes our eyes, and also two or three color-notes, as we might call them, higher up than the violet, which our eyes cannot see, and which are called ultra-violet.

WHY DOES MY FACE TURN WHITE WHEN I AM FRIGHTENED?

Here is another question about the fading of color, but it is very different from the last. The skin of our faces has a certain amount of color of its own, but the main part of the color of the face—at any rate, in this part of the world—is the color of the blood shining through the skin. When I say shining, I do not mean that the blood gives out any light of its own, but that it throws back to our eyes the red part of the light that falls upon it through the skin. It is the heart that, as it beats, drives the blood through the skin of the face. When a person is frightened, the nerves running from his brain to his heart almost stop the heart from beating. So scarcely any blood whatever is sent through the skin of the face, and we see the pale color of almost bloodless skin.

Anything that interferes with the heart's beating will have the same result as fright: bad air, for instance, causing anyone to faint. When a person's face becomes extremely pale, we should understand that there is a risk of his fainting, for if not enough blood is passing through his face, it is probable that not enough blood is passing through his brain. In some people, whose hearts are not well, it is difficult to supply the head with enough blood. These people are usually pale, and are liable to faint.

WHY DOES CHLOROFORM SEND US TO SLEEP?

All our consciousness depends upon work done by the brain. When we think, our brain is at work; or when we see, or when we feel pain. A person who has breathed a sufficient quantity of chloroform or ether, or who has had a large enough dose of opium or alcohol, cannot feel pain even when the skin is cut, because pain is really felt in the brain, and the brain of such a person is prevented from working.

The question, then, is: How do anæsthetics, as these things are called, stop the working of the brain? We do not know much about it yet, but we know that such an anæsthetic as chloroform is made up of certain chemical molecules; we can prove that when chloroform is breathed these molecules pass into the blood as it circulates through the lungs, and so are carried by it, in only a few seconds, to the brain. We know, too, that chloroform is a very volatile thing, and that it readily passes through the walls of the blood-vessels in the brain into the substance of the brain itself. There the chloroform molecules combine with the molecules of the brain, probably with the result that the brain can no longer use up the oxygen in the blood, and so has to stop working. But as soon as the person stops breathing chloroform, and the blood going to the brain becomes free of it, the chloroform passes back from his brain into the blood, is breathed away by the lungs, going back just by the way it came, and the person becomes conscious again.

WHY HAVE HORSES HAIR AND SHEEP WOOL, WHEN BOTH EAT GRASS?

It is one of the most wonderful facts about living creatures that they can turn into the substance of their own bodies almost any kind of food. As long as what they eat contains certain classes of chemical substances, they can use it as sources of the life of their bodies, and the life of their bodies produces the particular things that suit them.

Hair and wool are not really very different; wool is, indeed, only a kind of hair, and some races of men have quite wooly hair. But you might take certain kinds of food material, such as white of egg, and give it to any kind of animal, and it would be turned by each animal into a different thing—a bird would turn it into feathers, a sheep into wool, a fish into scales, a lobster into its shell, and a porcupine into quills. All this shows us how completely the life that is in every creature transforms its food, and can make, out of almost any food materials, the particular kind of thing that it is fitted to make. But no

kind of food that you can choose or imagine will make the horse grow scales or the fish grow hair or the lobster grow feathers. The particular kind of life in each creature can do what it is suited to do, but can do nothing else.

WHY DOES THE ELECTRIC BELL RING WHEN WE PRESS THE KNOB?

We can almost answer this question for ourselves if we have in the house one of those electric bells that one rings by pressing the knob of a little round wooden box at the end of a wire. If we unscrew the top of this little box, we find little pieces of metal inside it, and we see that, when nothing is touching them, they do not touch each other; but if they are pressed upon they do touch each other, and then the bell rings. When we press the knob—though we see nothing—what we do is simply to press these two pieces of metal against each other, and as long as they touch each other the bell will ring. When we stop pressing the knob, the *contact*, as we say, between the two pieces of metal is broken, and the bell therefore stops ringing.

These pieces of metal are connected with wires that run from an electric battery. When they touch each other, the electricity from the battery can run round the wire. As we think of the electricity running round, we call this arrangement an electric circuit. In the course of this circuit, or circle, there is a bell, so arranged that whenever the electricity passes along it, the bell is disturbed and rings. When we press the knob we complete the circuit; when we let go we break the circuit, and then the electricity can no longer run round.

WHY CANNOT A BIRD FLY IF LET FALL FROM A BALLOON THREE MILES HIGH?

This is a very cruel experiment to make, and I do not see how anyone who had not a heart as hard as adamant could defend it; but the result of it is very interesting. As we go high in a balloon, the air becomes less and less dense, and breathing more and more difficult. The pressure of the air outside is not high enough to force enough air into our lungs, and so the balloonists suffer a great deal. If they take up a bird with them, it must suffer in just the same way. So, one reason why such a bird, when let drop, cannot fly would be that its brain was affected by lack of air in its blood; but even if this were not so, the bird could not fly, because the air at such a height is too thin, or *rare*, us we usually say, to support it.

A man's body is heavier than water, yet the difference is not so great but that by making certain movements he can prevent himself from sinking. If something could be done to the water so that it became thinner and lighter, the time would come when he would sink, whatever efforts he made. The ocean of air is so thin that no man is strong enough to swim in it. This is true even of the air near the ground. But some miles up, the ocean of air has become so thin that even a bird, with its tremendous strength in proportion to its weight, is not strong enough to support itself, and so it must drop.

IS THERE A FIRE IN THE MIDDLE OF THE MOON?

When we speak of the fire in the centre of the earth, we do not mean anything that is burning in the sense that a fire is burning, but something that is very hot, and so would glow if we could see it. In the case of the earth we live on, we can dig downwards and find how hot it gets as we go down, and we can study the hot things that come up from volcanoes. But it is very difficult to find out how hot even the surface of the moon is, and we cannot dig into it. We can only guess what the inside of the moon is like, then, and we can do this in various ways.

There is no doubt that the inside of the moon was once very hot, for the moon is scarred with tremendous volcanoes which prove it. These volcanoes now, however, do nothing. The inside of the moon, therefore, is certainly nothing like as hot as it once was. Further, the very size of these volcanoes teaches us that the process of losing its heat in the case of the moon has been a very rapid and violent one. Now, we know the size of the earth, and can learn something of the rate at which it loses its heat. Also, we know that this loss is very much retarded by the great blanket which we call the atmosphere. The moon must be made of very much the same materials as the earth, and when it was formed must have been as hot as the earth; but it has not an atmosphere to keep in its heat, and it is so very much smaller than the earth that it would be bound to cool very much more quickly, just as the

earth, which is so much smaller than the sun, has cooled more quickly than the sun. Therefore, it is certain that the middle of the moon can be nothing like as hot as the middle of the earth, and probably it is not what we would call hot at all.

WHERE DOES OIL COME FROM?

If we look at the world around us to-day and observe where oil is being made, we find that it is made in the bodies of living things, and there only. The bodies of animals and human beings make it. You and I are, or ought to be, nicely clothed with a warm layer of fat, or oil, under our skins. The bodies of such animals as the fish make it, as in the case of cod-liver oil; the bodies of plants make it, as in the case of castor oil or olive or cotton-seed oil. Oils of these kinds, however, are little used for burning; and the enormous quantities of oil that are every day burned in the world are what is called mineral oil.

The word petroleum, for which petrol is short, means rock oil. Peter, as the Bible tells us, means rock. This mineral. or rock, oil is found in various parts of the world; and just in those same parts of the world there is found natural gas that can also be used for burning. It has quite lately been learned that we are wrong in supposing *mineral* oil and gas to be the products of minerals and rocks. When we examine such a thing as kerosene chemically, we find that it has the composition of a thing that has been made by a living creature. We now believe that all oil, even including petrol and such things, has been made by life.

Just as coal is the product of past vegetable life, so, also, all these oils which we now use for the same purposes as coal are the products of past vegetable life upon the earth, and they have been gradually formed from the bodies of these dead plants by the process called distillation, under the immense pressure of the earth lying above them.

WHY DOES A DIAMOND CUT GLASS?

When one thing cuts another, it is because the thing that cuts is harder than the thing that is cut. The steel of a knife is harder than paper, and so it will cut paper. Anything will scratch or mark anything else which is less hard. So we can take a number of different things and can arrange them in order. A list of ten things has been made in this way; and so we can say that glass, for instance, has the hardness of six, which means that it will scratch anything that has a hardness of one, two, three, four, or five, but will be scratched by anything having a hardness of seven, eight, nine, or ten.

Most glass and a knife are much of the same hardness. Pure rock crystal or quartz will scratch a knife and will scratch ordinary glass. The precious stone called a sapphire is harder than any of these, and ranks nine on the scale of hardness. Emery paper is coated with an impure sort of sapphire substance. Number ten in the scale of hardness is the diamond, which will cut any other thing whatever, including glass or a knife or a sapphire. The Greek word adamant means unconquerable. When we want to say that a thing or a person is as hard as can be, we say "as hard as adamant."

WHY HAVE WE DIFFERENT TASTES IN EATING?

We know that no two people look quite the same. Everyone's face is differently made from every other face. We know that when we take prints of the markings on people's fingers they always differ from one another. We have never yet found two finger-prints in different people that were quite the same. And just as people differ in their faces and in their skins, so they differ in deeper things. No two brains are quite the same, and so no two people have quite the same tastes.

But there are other special reasons why people have different tastes in eating. Different people's bodies have different needs. One person's body may require a good deal of fat, and may be very capable of digesting fat, and so that person will like fat and oily things —which may be less good for another person, and which that other person likes less. Then, again, at different ages we have different food requirements. Children are very active, and since they are small, lose their heat quickly. They therefore require a large proportion of food to supply them with energy and heat. Perhaps the best of such foods is sugar, and that is the good reason why children and young people like sweets and sweet things more than most

grown-up people do. This is not greed, but the demand of the body for what it specially needs. Thus tastes differ, too, in different parts of the world. Eskimos live in cold countries, and eat blubber and other forms of fat to keep them warm; but in hot countries people are much less fond of fatty foods.

WHY DO WE LEARN LATIN WHEN NO COUNTRY TALKS IT?

Not so many hundreds of years ago Latin was the universal language of all scholars. In those days, anyone who had a book to write wrote in Latin. So Newton in England, and Galileo in Italy, and Copernicus in Denmark, for instance, all wrote the same language. Anyone who meant to be a scholar, then, of course had to learn Latin. Things have utterly changed now, but children are still taught Latin, and the real reason is, that children used to be taught Latin, and therefore children are taught it to-day. The reason commonly given is that we must learn Latin in order to enjoy the great authors who wrote in Latin. If that were the real reason, then the teaching of Latin would be a terrible failure, as not one boy or girl in ten thousand ever gets to that point. Also, nowadays all the great writers of antiquity have been well translated into every modern language by great scholars who spent their whole lives in finding out the exact meaning of what those authors wrote.

Yet there is still a very good reason why everyone who has plenty of time for his education should learn a little Latin. This is that it helps us to understand and appreciate the value of English. For instance, take that last sentence. Everyone who has learned Latin knows that appreciate means "put a price to," and that the word value comes from a Latin word meaning *to be strong*, as when we say a valiant man, or that a person or a thing is invalid—not strong. If a boy has learned Latin for a few years at school, it thus helps him to use and enjoy his own language—which is half Latin.

WHY HAS OUR LANGUAGE SO MANY WORDS TAKEN FROM OTHER LANGUAGES?

Our language would be a very poor thing if it had not the advantage of helping itself to all the words it wants from other languages. Men had been reading and writing and thinking for many ages when our ancestors were savages. The various races who invaded Great Britain long ago brought with them their languages, and all the scholars who have read Greek and Latin have introduced words from those languages, such as the word "introduce," which means "lead within." English is the most mixed language in the world, and that is exactly the reason why it is the best, having more variety, more power of expression, more power of being turned equally well to purposes of beauty, to purposes of dignity, or to purposes of exactness, than any other language there is. Most of our commonest words are Anglo-Saxon in origin, a great many are Norman-French; a few are Keltic, many are German, and many more—the number of which is daily increasing—are Latin and Greek.

WHY HAVE WE DIFFERENT WORDS FOR THE SAME THING?

Language would be apt to be rather dull if we had only one word for everything. For instance, we should have to repeat it so often that it would become tiresome. Then, again, if we have different words for the same thing, we can use them, if we are clever, so as really to mean different varieties of the same thing. A poor language will have only one word where a very rich, full language, like our own, will have such words as joy, delight, pleasure, happiness, bliss, rapture, ecstasy—which all mean practically the same, and yet do not mean quite the same thing. We should use them to express different shades of meaning, and so we could say of somebody who became happier and happier that joy became bliss, and bliss became ecstasy.

Apart from this, there are many cases where we have two or more words for the same thing simply because they have come from different languages. For instance, commencement is sometimes used instead of beginning; the former comes from Latin, the latter is the good old Anglo-Saxon word, and we should always use it in preference to the other. Then, also, we have words which are really the same, only that one of them has come to us from Latin through the French; while the other is a word which came into English directly from the Latin at the time of the revival of learning.

Such words are called doublets, like loyal and legal, royal and regal, sure and secure, and many more.

IS THE COLD OF WINTER DUE TO THE SUN'S GREATER DISTANCE FROM THE EARTH?

The earth is *not* farthest from the sun in winter; it is then nearest to the sun. But the distance of the earth from the sun has really nothing to do with the weather in any way, and we should get this clearly into our minds. The fact that the earth does not move in a circle round the sun, but in an ellipse, as we know, so that its distance from the sun varies, is enormously important, because the law of gravitation would not be true if the earth moved in a circle. Indeed, Newton measured and discovered gravitation partly by knowing how the earth moves round the sun. But the path of the earth, though not a circle, is very nearly a circle; and the difference in its distance from the sun at different times is far too small to affect the weather. It may be that, long ages ago, the earth's path was much more elliptical than it is now, and then the difference in its distance from the sun may have been very important for the weather—but not now.

WHY DOES IT RAIN MORE IN WINTER THAN IN SUMMER?

The last question was wrong in what it suggested about the earth's distance from the sun, but it pointed out a very interesting fact all the same. For the sun's heat is much less in winter than in summer, even though the earth is rather nearer to the sun; and the reason for this is, that owing to the slight tilting of the earth, the rays of the sun do not come straight in winter, but slant, and so lose more heat on the way. So the question now is why there should be more rain when there is less sun to make rain. But, if we consider, we shall see that this reduction of the sun's heat in winter "works both ways." If there is less sun to draw up the rain, there is less sun to hold the rain or moisture in the air. Thus it might be that during the summer the warm sun drew up much moisture into the air, and that during the winter, when the air is cooler and can hold much less moisture, the rain came back again. There is probably a good deal of truth in this, but it is far from being the whole truth. There are wet days in summer, and there are often beautifully clear and dry days in winter. These facts are sufficient to show that the heat of the sun in various parts of the year is *only one* of the factors of the weather, as we say; *factors* is Latin for *makers*. At bottom the problem of the weather is really one of the atmospheric electricity, and we cannot answer all these interesting and important questions about the weather fully until we learn very much more about that.

HOW IS IT THAT WE LOSE THE SENSE OF SMELL WHEN WE HAVE A COLD?

The sense of smell depends upon scented things coming in the air to the lining of our noses, especially certain small parts of the lining of the nose. When we have a cold, this lining, or mucous membrane, of the nose gets swollen, and produces a much greater amount of mucus than usual, as we all can tell by the number of handkerchiefs we have to use in a day. The chief reason why we cannot smell so well when we have a cold is, I think, that this mucus, constantly pouring out of the lining of the nose and running over it, prevents the scent of things from getting to the sensitive part of the nose, and washes away any solid scented particles that there may be in the air. Also, it may very likely be that the poisons produced by the microbes that cause a cold, poison the living cells of the mucous membrane, and also poison the tiny ends of the nerves of smell that run to it, so that even if scented things do reach the sensitive part of the mucous membrane, they cannot be felt.

This applies alike to scents coming in from outside and also to the scents of food, which pass up at the back of the roof of the mouth into the nose, and which, when we have not a cold, help to give our food half its flavor.

IS EVERYTHING A PART OF NATURE?

Certainly everything is a part of Nature. All truly great men, ever since men began to think, have known this. An English poet has said that all things are

> Parts of one stupendous whole
> Whose body Nature is and God the soul.

That was said by Pope. A later poet, Wordsworth, has written these lines, amongst the greatest in all our great

poetry. He says that he sees in Nature something

Whose dwelling is the light of setting suns
And the round ocean, and the living air,
And the blue sky, and in the mind of man:
A motion and a spirit that impels
All thinking things, all objects of all thought,
And rolls through all things.

Thousands of years before even Pope or Wordsworth, the great Indian thinkers saw the same thing, and said, "the real is one." Man, therefore, as Wordsworth said, his body and his mind, are parts of Nature. The laws of Nature and the laws of life apply to him, and the more we learn the surer we are that we are right when we call the whole of Nature the universe—a thing that turns and moves as one because it is a whole of which everything that exists is a part.

WHY CANNOT TWO PEOPLE DECIDE WAR AND SO SAVE MANY LIVES?

It is only the bad passions of men which prevent this from being possible. If two good and honest men, or two good and honest countries, have a difference of opinion about something, they will meet and talk it over, and will try to find out which is the right thing to do. If they cannot agree they will appoint some other person or country that they both trust to decide what is the right thing, and they will undertake to stand by what he decides. The person who does this in a game of baseball is called the umpire. The Latin word for an umpire is *arbiter*. So, when nations, or single persons, or employers and workmen use this method of settling their differences, it is called *arbitration*. It is, of course, in every way the best plan for settling differences.

But all nations are not good and honest, and if a nation wants something which it has no right to have, and knows that no arbitrator would award that thing to it, then it invents some false excuse, usually about its honor, and proceeds to dishonor itself by making war. This injures not only the nation it makes war upon, but itself and all other civilized nations. Gradually, as people come to see this, they will make those who govern the nations undertake to refer most disputes to arbitration. This change from war to arbitration is slowly but steadily going on, and will certainly continue until wars become less frequent. That will happen directly the ordinary people of all countries have sense to understand what harm war may do to them.

WHY DOES YEAST MAKE BREAD RISE AND BUBBLE?

The bread, or, rather, the dough, contains a certain amount of sugar, which has been made in it from the starch made by the wheat plant. Yeast consists of an enormous number of tiny living plants, which produce inside their bodies a ferment—a chemical substance which we have just learned how to separate from the yeast cells themselves; and this ferment has the power of working on the sugar in the dough so that it is broken up and changed into other things. These things into which the sugar is changed are two, alcohol and carbon dioxide. We lose all the alcohol thus made, for it passes away into the air. The total amount of alcohol we thus lose in a year is enormous, and this is a pity, since we might use it for many purposes, especially for burning in lamps and motor-cars, and so on.

The carbon dioxide, as it is formed, makes little bubbles in the dough, and as these get bigger and more numerous, they raise the dough and turn it into bread. We can make bread in another way by forcing carbon dioxide into the dough from outside. This is perhaps rather a good way, for it saves the sugar in the bread, and that is a food.

WHAT CAUSES THE SPOTS ON THE SUN?

Though men have been watching sun-spots steadily for 300 years, and though we know a great deal about them, this question is a most difficult one to answer. We are not really quite sure at what depth in the surface of the sun sun-spots lie. They are certainly not quite on the surface of the sun, and they are dark because, as we can prove, less light and less heat come out from a sun-spot than from other parts of the sun. If we think of the whole of the sun's surface as a gas—as a glowing atmosphere indeed—we shall expect to understand it better when we know more about what happens in our own atmosphere.

We know that all sorts of twisting, twirling movements go on in the air, some of them being very large and traveling across it as they twirl; and the new experience of the air which people are gaining by flying through it

in flying machines has taught us that these kinds of movements are to be found everywhere. But the sun's atmosphere is part of a globe which entirely consists of gas, and is intensely hot. So we may expect to find far more movement in it than in our own, and sun-spots must be caused by things which are going on much deeper down in the surface of the sun; and so, as the sun spins, the sun-spots we see spin with it, as we can see if we look at the three pictures on page 2087.

IS THE WHITE OF AN EGG PART OF THE CHICKEN, OR WHAT THE CHICKEN FEEDS ON?

The white of the egg, and very nearly the whole of the yolk, too, are not part of the chicken, but what it feeds on. If we look at an egg that has just begun to develop, we can see just at one point on the surface of the yolk the little thing that will be the chicken; and a day or two later we can see tiny little blood-vessels spreading out from this point over the yolk, so as to help themselves to the food in the yolk. Afterwards the white of the egg is also eaten up by the chicken. The white of an egg consists of albumen and water. Albumen means the *white* thing.

This egg albumen is not the same as the albumen which is in our blood and on which our bodies feed, but it is really very similar. When it is eaten up by the developing chicken, or when we eat the egg, young chicken and all, this egg albumen is changed by digestion into the blood albumen of the chicken or of ourselves, as the case may be. As nearly all the egg is nourishment for the young creature that is to develop, different kinds of eggs vary very much in size quite apart from the size of the creature that is to develop from them. Some creatures are born from eggs which contain no nourishment, as the nourishment is supplied in other ways, and such eggs may be so small that they can only be seen through the microscope.

HOW IS IT THAT FISHES ARE NOT SALT WHEN CAUGHT?

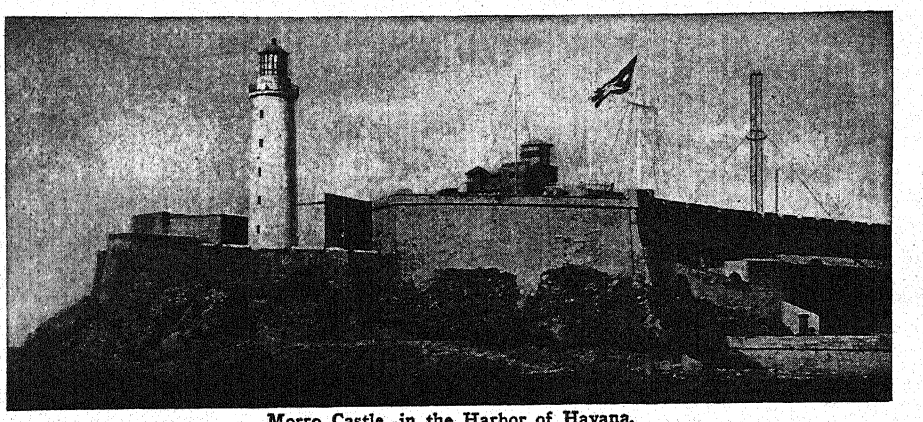
The part of the fish by which we judge is its muscles, which form its flesh, and which we eat. Though the fish swallows salt water, it only takes into its blood what it requires for the purpose of its life. If we look at it in this way, we shall understand how it is that the saltness of a fish's muscles is not very different from that of a chicken's muscles. When we study the whole animal world, we find that the proportions of salt required in the water or in the blood that we find in the bodies of many different creatures are very much the same. The cells that make up muscles are very much the same in their way of living and their needs, whether we find them in a bird, a fish, an ox, or ourselves. Thus we should not expect to find the flesh of the fish salter than that of another creature nor to find that it makes any particular difference whether the fish is a salt-water fish or a fresh-water fish. We must remember that the fish, like ourselves, has the power of choosing from the things which it swallows just those things which it needs for its life, and of taking them, and them only, into its blood.

WHY HAVE FACTORIES TALL CHIMNEYS?

We know only too well that the business of the chimneys is to carry the smoke from the furnaces into the air. It may be that if the chimneys are tall, it makes a better draught for the furnaces, but that is not the important thing. The point is that, according to our present way of burning coal, a large amount of the coal is wasted, and simply blown up the chimney without being burnt in the form of smoke. In the air this injures everybody and everything—men, animals, plants, pictures, houses, and all. But the higher it is sent into the air, the better is its chance of being blown away and thinned out before it settles. Evidently it would not do to have a chimney discharging factory smoke at the level of somebody's bedroom window, for instance.

But I fear that tall chimneys will be wanted—ugly though they are—even when we burn all our fuel in factories in a proper way, and discharge into the air only the gaseous products of its complete burning. Even in the most perfect kind of burning there must always be carbon dioxide produced, since the chief element in fuel is carbon, and since carbon dioxide is completely burned carbon. This gas, which we produce ourselves as we burn, is a poison to us if there is too much of it in the air, and so it must be sent into the air as far away from our mouths as possible.

THE NEXT QUESTIONS ARE ON PAGE 3383.



Morro Castle, in the Harbor of Havana.

SOME MODERN HEROES OF SCIENCE

Continued from 3071

IN olden days men were called "heroes" only if they showed bravery on the battlefield, or in daring adventure. Those fighters and adventurers were worthy of the name, for they fought courageously against their country's foes. But the only enemies the ancients recognized were invading armies or attacking fleets. They looked on plague and famine and misery as punishments sent by the gods to which they must submit. Today, we know that disease and poverty and ignorance are just as truly enemies of mankind as any forces of land and sea. And because we know this, there is always a small army of devoted men ready to give up their lives to save their fellows from destruction. This army of heroes enjoys no truce with the enemy, and concludes no treaty. Its soldiers risk their lives against foes often unseen, and every fight is to the finish, no matter what the sacrifice.

This story is about four doctors, who because of their heroic fight in Cuba against yellow fever, provided means of defence against it for the entire world. These men, Major Walter Reed, a surgeon in the United States army, James Carroll, Jesse W. Lazear and Aristides Agramonte, were assisted in their experiments by other brave volunteers, chiefly soldiers of the United States army who were stationed in Havana.

When Cuba came under American protection, she was cursed with a greater enemy to mankind than any foe ever faced on the battlefield. Yellow fever, that dreadful tropical disease, has slain thousands and tens of thousands. Its history is one of destruction and death in the West Indies, on and along our southern coasts and in the ports where ships hail from the tropics. Havana, the great shipping centre for Cuba, seems to have fared worse than any other place. For centuries it has been a helpless victim of one outbreak of the fever after another.

No one knew how the disease came, or in what way it was carried from one person to another. Many thought that in some mysterious way it was carried in the air; others believed it was spread by touching clothing, bedding, or any other article that had been on or about a yellow fever patient; again, there was a very general belief that the disease came entirely from filth and uncleanliness. So, when Cuba came under our protection and Havana's troubles became our troubles, our first thought was to help in any way we could to save the city from its old enemy, yellow fever. It was

Copyright, 1911, 1918, by M. Perry Mills.

planned, first of all, to clean up the city. This was done with the hope that the fever would not appear again. But in spite of the care, the disease broke out and raged in the very parts of the city thought to be the most sanitary.

It was clear that the cause of the fever had not been found. Something else must be tried. It was at about this time that Doctor Carlos Finlay's " mosquito theory " began to attract attention. As a Havana physician, he had said, twenty years before, that he believed this fever was carried from one person to another by a certain kind of mosquito. No one believed him at first, as he could not advance any real proofs of his theory. But when the United States government appointed a Yellow Fever Commission to search for the cause of the disease, it was proved that he was right after all.

In the commission, Doctor Reed was chairman and head of affairs; Doctor Carroll had charge of the bacteriological work; Doctor Lazear had the mosquito work, for he had already been studying the insect, and Doctor Agramonte had charge of actual yellow fever patients. The doctors tested all the common theories of the cause and transmission of yellow fever, and they found that the theories were wrong. There remained only the belief of Doctor Finlay, that the poison was carried from a yellow fever patient to some one who was quite well, by a certain kind of mosquito, " stegomyia fasciata," also called " aëdes calopus."

As no animal takes the disease, there at once arose the tremendous responsibility of using for experiments human beings who had never had the fever. The doctors consulted together and decided that, as the results were so important, the risk was justified. They said, however, that they would never use any but volunteers for the purpose, and these only if they were fully informed of their danger. Further, they agreed that it was their duty to run the risk themselves before allowing any one else to do so.

Doctor Reed had to go back to the United States just at this time, and so Doctor Lazear began the experiment. He took some mosquitoes which had been hatched and reared in the laboratory, and allowed them to bite four yellow fever patients. Then he applied these infected mosquitoes to himself and some other persons, but all without result.

Doctor Carroll next allowed himself to be bitten by an insect he knew to be infected. In a few days he developed yellow fever, and was carried to the isolation camp. His life hung in the balance for three days, after which he gradually recovered. Doctor Lazear was bitten a second time. Five days after Doctor Carroll was allowed to leave his bed, Doctor Lazear was stricken with yellow fever. Before he was removed to the isolation camp, he made over to Doctor Carroll all his notes on mosquito research and told him his own personal experience. For three days he held his own in the illness, then fatal symptoms developed, and four days later he died, leaving a widow and two little children, the younger of whom he had never seen. He was only thirty-four when he thus knowingly risked his own life that his fellow men might live in comfort and happiness. His death was a great loss to the Commission. On the tablet to his memory in the surgical amphitheatre of Johns Hopkins Hospital in Baltimore you may read the following words:

" With more than the courage and devotion of the soldier, he risked and lost his life to show how a fearful pestilence is communicated and how its ravages may be prevented."

The three surviving doctors then decided that, having proved that a special kind of mosquito could carry yellow fever, they would next try to prove that there was no other way in which it could be carried. Otherwise, the confusion and dread which surrounded the disease would not be lessened, but rather increased. It was decided to have an experimental station one mile away from Quemados, Cuba, and carry the work on there. In honor of their dead comrade, the camp was named Camp Lazear. After setting up tents for the members of the station they built two houses, one called the infected-mosquito house, and the other the infected-clothing house. The infected-mosquito house was divided into two rooms separated from each other by a wire screen. In one room were placed mosquitoes that had been fed on the blood of yellow fever patients while the other room was kept entirely free from the insects. The plan was to put men who had never had the disease in each room and wait results. Volunteers were called for.

दान में अप्राप्त पुस्तक

Immediately two young soldiers, John Kissinger and John Moran, both from Ohio, offered to go into the room with the infected mosquitoes, "solely in the interest of humanity and the cause of science." Doctor Reed explained fully the danger and suffering involved, but they listened unmoved. Seeing that they were both determined, he then told them that a money compensation would be made them. Both men refused to accept it, saying that they would not submit to the experiment at all if a reward were offered. Whereupon Major Reed touched his cap, saying respectfully, "Gentlemen, I salute you."

Then the soldiers passed into the little room with the poison-bearing insects. They allowed the deadly mosquitoes to bite them, and, after three days, developed the fever. The men who lived in the room where there were no mosquitoes showed no signs whatever of the disease.

The infected-clothing house had been built for the purpose of proving that clothing and linen taken from yellow fever patients did not carry infection, as had been believed for many years. It was small and unsanitary. As soon as the experiments with Kissinger and Moran had been made, volunteers were asked for to live in this room filled with clothing, linen and blankets, which had been used by yellow fever victims, and which had not been cleaned.

Offers again came quickly. Doctor Robert F. Cooke and two young privates entered the house, and deliberately unpacked boxes of such clothing and linen, thoroughly shaking and handling them in the process to scatter the germs if there were any. Each morning the soiled articles were packed again in the box and at night unpacked and distributed about the room. For twenty nights they repeated this, and slept in beds which had been used by victims of the terrible disease. They showed no sign of the disease during this time and the quarantine was lifted. With the greatest cheerfulness and self-sacrifice, these men had slept for three weeks in a small, badly ventilated room in a temperature that was over 90°, and amid infected clothes and garments.

So the heroic work went on. Experiments were made under more and more trying conditions. Men wore clothing of yellow fever patients for days, they slept in infected bedclothes, they allowed themselves to be bitten by mosquitoes that had fed for days upon yellow fever patients, they exposed themselves in every possible way to the attacks of this disease.

All this sacrifice was made to give one great truth to science. We know now, beyond doubt, that the mosquito, "stegomyia fasciata," is the tiny man-slayer. We know too that it is the only agency by which the disease is carried from one person to the other. There is no danger from the dreaded disease so long as one has not been bitten by this kind of mosquito.

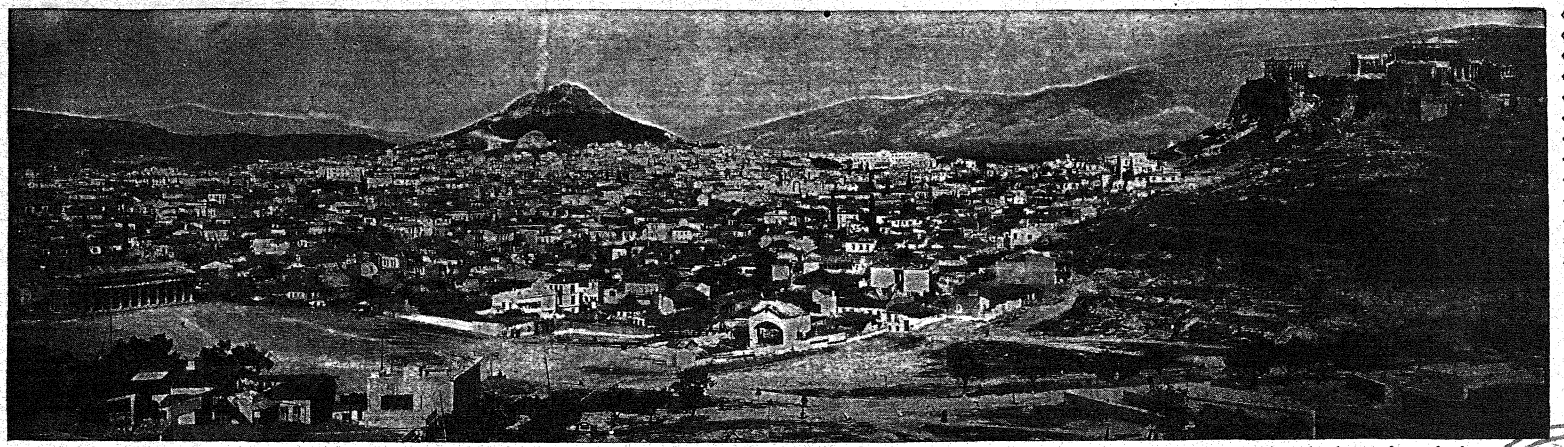
As soon as these facts were made known those in charge at Havana set to work to kill off the deadly mosquito. There have been small outbreaks from time to time and the disease has appeared along the southern coast; but it has been stamped out and it is not likely that these places will ever have another terrible scourge.

Of the heroic pioneers in this fight against tropical disease, Doctor Carroll, as you know, was the first person who took the fever, through deliberate mosquito inoculation, and barely escaped with his life. Doctor Lazear and some of the volunteers died. Doctor Reed braved the perils of his companions and was the inspiring genius of the investigation. Though he escaped with his own life, his health was so broken that he did not recover from the fever contracted during the following year—but his campaign against yellow fever was a great victory.

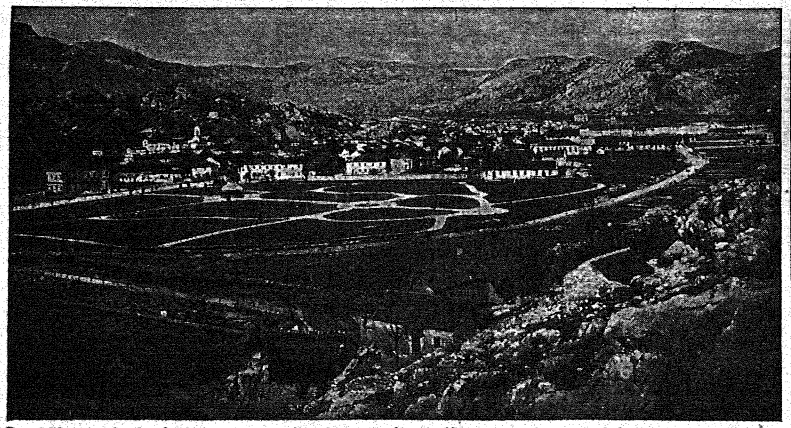
Because of the splendid work accomplished in Cuba, it was possible to banish yellow fever from the Isthmus of Panama. Previous experiments to discover the cause of malarial fever had showed that it too was carried from man to man by the mosquito, although by another variety—the "stegomyia anopheles"—and because of the great "clean-up" of the mosquito in Cuba by the Department of Health, the example was followed in Panama and both the fasciata and the anopheles were banished from the zone. Thus, it was made possible for white workers to live there and cut the great canal. As you may read in another part of our book, malaria and yellow fever had done much harm while the French were trying to dig the canal.

THE NEXT GOLDEN DEEDS ARE ON PAGE 3295.

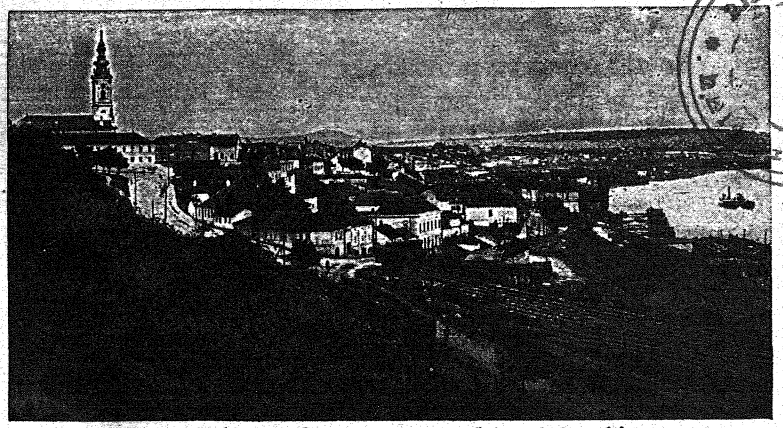
ANCIENT CAPITALS OF MODERN COUNTRIES IN THE NEAR EAST



3238 Less than a hundred years ago Athens was a wretched village, but it is now a fine city, and the ruins of the Acropolis cast upon it the shadow of a glorious past.



Cettinje, capital of Montenegro, lies in a rocky valley, two thousand feet above the sea.



Belgrade, capital of Serbia, was for many years an Oriental city with many mosques.